PB-230 714

POLLUTION OF LAKE SUPERIOR AND ITS TRIBUTARY BASIN - MINNESOTA-WISCONSIN-MICHIGAN. PROCEEDINGS OF CONFERENCE, SECOND MEETING OF THE SECOND SESSION (RECONVENED) HELD AT DULUTH, MINNESOTA ON JANUARY 14-15, 1971. VOLUME 2

Environmental Protection Agency
Washington, D. C.

1971

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PROCEEDINGS

SECOND MEETING OF THE
SECOND SESSION (Reconvened)
DULUTH, MINNESOTA
January 14-15, 1971 Volume 2

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CONFERENCE

In the Matter of Pollution of Lake Superior and its Tributary Basin–Minnesota–Wisconsin–Michigan

ENVIRONMENTAL PROTECTION AGENCY - WATER QUALITY OFFICE

SECOND MEETING OF THE CONFERENCE

IN THE MATTER OF

POLLUTION OF LAKE SUPERIOR AND ITS TRIBUTARY BASIN

IN THE STATES OF MINNESOTA, WISCONSIN, AND MICHIGAN,

RECONVENED UNDER THE PROVISIONS OF SECTION 10

OF THE FEDERAL WATER POLLUTION CONTROL ACT

VOLUME II

Great Hall
Radisson Duluth Hotel
Duluth, Minnesota
January 15, 1971

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Second Session of the Conference in the Matter of Pollution of Lake Superior and Its Tributary Basin in the States of Minnesota, Wisconsin, and Michigan, reconvened under the provisions of Section 10 of the Federal Water Pollution Control Act.

- - -

PRESIDING:

Murray Stein, Assistant Commissioner for Enforcement, Environmental Protection Agency, Water Quality Office, Washington, D.C.

- - -

CONFEREES:

Ralph W. Purdy, Executive Secretary, Michigan Water Resources Commission, Lansing, Michigan

Francis T. Mayo, Regional Director, Great Lakes Region, Environmental Protection Agency, Water Quality Office, Chicago, Illinois

Thomas G. Frangos, Administrator, Division of Environmental Protection, Department of Natural Resources, State of Wisconsin, Madison, Wisconsin

CONFEREES, Continued:

Donald J. Mackie, Executive Assistant, Department of Natural Resources, State of Wisconsin, Madison, Wisconsin

Robert C. Tuveson, Member, Minnesota Pollution Control Agency, Albert Lea, Minnesota

John P. Badalich, Executive Director, Minnesota Pollution Control Agency, Minneapolis, Minnesota

Dr. Howard A. Andersen, Chairman, Minnesota Pollution Control Agency, Minneapolis, Minnesota

- - -

ALTERNATE CONFEREE:

Dale Bryson, Director, Lake Superior-Upper Mississippi River Basin Office, Environmental Protection Agency, Water Quality Office, Minneapolis, Minnesota

- - -

PARTICIPANTS:

Charles R. Skinker, Vice-President, Parsons-Jurden Corporation, New York City, New York.

Dr. Leon W. Weinberger, Consulting Engineer, Potomac, Maryland.

PARTICIPANTS, Continued:

Bruce M. Niss, Consultants Assistant, Northern Environmental Council, Duluth, Minnesota.

- - -

PROCEEDINGS

MR. STEIN: Let's reconvene.

We have several telegrams I would like to put in the record, as if read.

From Houghton High School, signed by a number of students and Barbara Clark, Faculty Advisor:

"Houghton High School biology students and Students for Pollution Control Club urge Reserve Mining Company stop immediately further dumping of tailings into Lake Superior."

Without objection, these telegrams will appear in the record as if read.

Telegram from Mrs. Warren Olson of Fridley, Minnesota:

"Please enforce strict water quality standard."

Telegram from Barbara Jensen of Fridley, Minnesota:

"Don't let Superior get drier."

And a letter from Mrs. Elois Scott of Hancock, Minnesota.

Where is Hancock -- Michigan or Minnesota?

MR. PURDY: Michigan.

MR. STEIN: Hancock, Michigan. I stand corrected.

"Conferees:

"It is of great concern to my family that Reserve Mining Company be stopped immediately from dumping 60,000 tons of fine taconite particles into Lake Superior daily.

"We have a cottage in Lake Superior. We have lived there fifteen summers. All the water we have used comes from Lake Superior because of its purity.

"We urge you -- please save this unique body of water for future generations.

"Sincerely, Mrs. Elois Scott."

MR. BADALICH: Mr. Chairman, I have several letters which I would like to introduce into the record received in my office yesterday.

I have one here from Mrs. Helen W. Jones, which I would like to put in the record. There is no address on this one.

"To Whom It May Concern:

"In 1940 for the first time my husband and I visited Beaver Bay and the North Shore of Lake Superior. Since then our family (children and grandchildren) have been enjoying vacations every summer in that beautiful place.

"It has everything to commend it: exhilarating climate; great sparkling Lake Superior; woods, falls and streams. It is one of the beauty spots of America.

Communications

"Now things have changed. The lake, formerly a clear, sparkling blue, has become, from time to time, a clouded green. The commercial fishing, once a flourishing business, has declined to almost nothing. These changes have increased this summer. Pollution is here!

"It is believed this is due to the thousands of tons of taconite tailings dumped into the lake. These tailings have been found on the Wisconsin shore and towards Duluth.

"There is nothing so powerful as public opinion. So it is imperative that concerned citizens register their opposition to this spoilation of Lake Superior and work to stop it.

"Lake Erie has been ruined. Let us stop the pollution of Lake Superior."

Another one from Sara M. Koenke from West St. Paul:

"To Whom It May Concern:

"I have been a visitor on the North Shore of Lake Superior since my marriage in 1944 and a land owner since 1958. I am a native of Ohio and watched the pollution and destruction of Lake Erie. One by one beaches were deserted because of the contamination by man for selfish and lethargic reasons.

Communications

"I visited Lake Superior and was delighted and overwhelmed to discover another great body of water which was clean and clear. My children learned to love Lake Superior, as I, in my childhood, had loved Lake Erie. Our dream to own land here was realized in 1958 and until 1962, the lake was clear and a blue in color that only God could rival. This is the year that my high school daughter began to write letters to Congressmen and Senators to protest the green color in the water. I am proud that she is still conservation minded and does 'her thing' in Seattle, Washington, now that she is married.

"Our taxes have been raised along the shore at an alarming rate to subsidize the iron ore plant which is pouring tons of tailings a day into the lake. This does cause a green color which was never seen before. Taxes above the highway 61 have been reduced to help the iron ore area. I am paying more taxes to have my lake change color. I liked it the way it was."

Another one from Liz K. Greenhagen of Seattle, Washington:

"To Whom It May Concern:

"I am writing in reference to the changes in water color and pollution of Lake Superior by the Taconite Mining Company of Silver Bay, Minnesota. My parents have owned a cabin on Lake Superior below Silver Bay since 1958. Since 1958 and a few years before, we have been coming up to the lake. From 1955 to 1959, the lake was crystal clear with no evidence of the 'green water current' which carries the taconite tailing wastes from the Silver Bay plant. The tailings became visible a few years later and in 1961-1962 the sludge was visible along the shore as well as in the deeper water. The fine tailings were visible in the drinking water which was obtained from the lake on many occasions and not just on stormy days. During the time after 1962 and up to 1968, there was a marked difference in the water color and the 'green water current' became wider and more pronounced. It was visible on all visits to the lake. Even when the lake was stormy and gray, the definite 'green water' was still visible and distinguished. The trail was usually in the same position, about a couple of miles from the shore. The difference in water color was noticeable from Duluth all the way to Silver Bay and was seen emitting from that particular plant. This 'green water' to which I have referred is not just a temporary color change due to light, but the presence of a foreign body or contaminate can also be seen. The difference is visible to anyone watching the lake.

"Lake Superior used to be a source of beauty and enjoyment for those who visited it, but for more than 8 years the beauty has been marred by pollution. The State of Minnesota cannot afford to let such a natural beauty and asset become a source of pollution and contamination. Minnesota is supposed to be 'the land of 10,000 lakes. How can one identify with a State when the largest fresh-water lake has become a hugh body of polluted water?"

And another one from -- it looks like Lyn Richardson from Bloomington, Minnesota.

"To Whom It May Concern:

"I am writing you in regard to the change in the environment and appearance of Lake Superior on the North Shore, from the time of our first trip in 1929 to the present date, and in the area approximately from Little Marais to Two Harbors.

"We made the area of Beaver Bay our summer headquarters, and explored and fished up and down the lake. We were fortunate enough to be privileged to go out to the nets with a commercial fisherman, besides trolling during this period.

"When we first came, the lake was a clear blue color and the water was so clear, clean, and unpolluted, we took it up by a water wheel and bucket, and never had we had such good drinking water.

"After the coming in of the taconite processing plant at Silver Bay, we have gradually, but surely, seen the tailings floating farther and farther down shore. This last September we noticed the green water as far as the Two Harbors area.

"We believe if this is allowed to continue, this great lake will be destroyed for all time, when it is so unnecessary."

And then also a statement from the RJR Foods Company of Duluth regarding their discharge in respect to this conference.

I would like to have this also placed in the record.

MR. STEIN: Without objection, all those will be placed in the record, as if read.

(The statement from RJR Foods follows in its entirety.)

RJR Foods, Inc.
5020 Roosevelt Street
Duluth, Minn. 55801
Telephone 218 628-1021

RJR Foods

January 14, 1971

Mr. John Badalich
Executive Director
State of Minnesota
Pollution Control Agency
717 Delaware Street S.E.
Minneapolis, Minnesota

Dear Mr. Badalich:

Attached is an analysis of our cooling water being discharged into the swamp area outside of our plant as submitted by Earl Ruble and Associates, Inc., Professional Consultants.

The report confirms the findings of the previous report submitted to the Conference and read into the record on August 12, 1970 (12 copies submitted).

The analysis report indicates that the water we are discharging into the swamp area is good clean water.

We also enclose a copy of our August 12, 1970 reports.

Very truly yours,

RJR Foods, Inc.

Jim Bingham

Jim Bingham
Executive Plant Manager

JB:el
Enc.

CC: R. D. Miller, Acting Chief, Section of Enforcement, Mpls.
George Koonce
Duluth City Council
Howard Wold, City Clerk
Hon. Ben Boo, Mayor

EARL RUBLE and ASSOCIATES, INC. **PROFESSIONAL CONSULTANTS**

217 LAKE AVENUE S. DULUTH, MINNESOTA 55802 Tel. 218/722 3953

January 13, 1971

Mr. Jim Bingham, Plant Manager
R. J. Reynolds Foods, Inc.
200 North 50th Avenue West
Duluth, Minnesota 55807

Dear Mr. Bingham:

We have instituted a weekly sampling and recording program for R. J. Reynolds Foods, Inc. plant effluent as required by the Pollution Control Agency.

A twenty-four hour composite sample was taken from the basement discharge trough 2:00 P.M., January 6, through 2:00 P.M., January 7, 1971. Flow was recorded over this same period. The results of this sampling and a grab sample taken December 16, 1970, are as follows:

	December 16, 1970 Grab	January 7, 1971 Composite
B.O.D.	<1	<1
Total Suspended Solids	2.4 mg/l	5.4 mg/l
Coliform	0	0
pH	7.3	7.5
Phosphorus	---	.07 mg/l
Temperature	74° C.	60°C.

The flow for twenty-four hours January 6 - January 7 was 120,000 gallons made up of retort cooling water. Any solids finding their way into the effluent would be food products washed from cans during the cooling process and a matter of housekeeping.

There is no addition of chemicals to this water.

Very truly yours,

EARL RUBLE & ASSOCIATES, INC.

Earl H. Ruble

Earl H. Ruble, P. E.

Gary Baker

Gary Baker
Laboratory Division

GB:jw

RJR Foods, Inc.
5020 Roosevelt Street
Duluth, Minn. 55801
Telephone 218 628-1021

RJR Foods

August 12, 1970

Mr. John Badalich
Executive Director
State of Minnesota
Pollution Control Agency
717 Delaware Street S.E.
Minneapolis, Minnesota

Dear Mr. Badalich:

Attached are two reports on Plant effluent concerning RJR Foods, Inc., West Duluth Plant facilities.

1. A report from our Plant Engineer describing the discharge water, swamp area, and also finding a problem and making the necessary corrections.

2. A report from Ruble and Kaple, Inc., Consulting Engineers of Duluth, Minnesota showing the analysis of our waste water taken at our final discharge pipe flowing into the swamp area which concludes that the water we are discharging into the swamp area is clean water.

We have set up a twice daily visual inspection of our discharge facilities so we may be immediately aware should any change in the water discharge take place. This is a very remote possibility because of the corrective action we have taken.

Very truly yours,

RJR FOODS, INC.

Jim Bingham

Jim Bingham
Executive Plant Manager

JB:el
Enc.

FOODS R. J. REYNOLDS FOODS, INC.

INTER-OFFICE CORRESPONDENCE

DATE: August 11, 1970

TO: Jim Bingham

FROM: Art Christensen

SUBJECT: Water Problems

I hereby certify that this plan, specification, or report was prepared by me or under my direct supervision and that I am a duly Registered Professional Engineer under the laws of the State of Minnesota.

Date [illegible] Reg. No. 6351

CHRISTENSEN

Our plant effluent is separated into two discharges. One discharge is piped to the city sanitary sewer, and the second discharge is piped to a swamp immediately north and west of our property. Point of discharge into this swamp is 1,200 ft. from St. Louis Bay.

The first discharge piped, to the sanitary sewer, collects all floor drains, wash stations, sinks, lavatories and toilet facilities. The second discharge, discharging to the swamp, collects only retort cooling water and condensate from heat exchangers.

Results of tests conducted last October on discharged retort cooling water showed a BOD of 25 mg/L, which is within limits established by the State of Minnesota Pollution Authority.

Results of tests conducted in May of this year disclosed a BOD of discharged retort cooling water of 30 mg/L, which is 5 mg/L above the upper limit established by the State of Minnesota Pollution Control Authority.

We investigated to determine the cause of the increase. We found two breaks in our sanitary sewer line in the piping tunnel under our cannery floor. These breaks were leaking solids to the piping tunnel floor and into the retort cooling water trench. We resolved to repair those leaks at our earliest opportunity.

During our plant shut down for overhaul in July, we made repairs to the sanitary sewer lines to stop all leakage.

Results of test, copy attached, show a BOD of less than 1 mg/L which is less than can be measured by standard BOD test.

Art Christensen

RUBLE AND KAPLE INC. PROFESSIONAL CONSULTANTS

217 S. LAKE AVENUE ○ DULUTH, MINNESOTA 55802 MINN. 218/722-3953
WISC. 715/392-2912

August 11, 1970

Mr. Art Christianson
R. J. Reynolds Foods
200 North 50th Avenue West
Duluth, Minnesota 55807

Dear Mr. Christianson:

The results of the tests run on the water sample collected by our laboratory personnel on Monday, August 3rd, are as follows:

Plant effluent:	B.O.D. (5 days @ 20° C.)	< 1 mg/1
	Coliform organisms	0 per 100 cc.
	Total Suspended Solids	1 mg/1
	Turbidity	1 J.T.U.
	Phosphate as P	.04
	Kjeldahl Nitrogen	< .1 mg/1
	pH	7.2
	Temperature	75° F.

Very truly yours,

RUBLE AND KAPLE, INC.

Gary Baker

Gary Baker
Laboratory Division

GB:epm

MR. STEIN: Mr. Badalich.

MR. BADALICH: That is all I have.

MR. STEIN: But will you continue with the Minnesota presentation?

MR. BADALICH: All right. I believe at the time we recessed yesterday, Mr. Fride, representing Reserve Mining Company, was handling the presentation. We heard from Mr. Furness, the President, and I believe I would like to call upon Mr. Fride this morning to continue the presentation for Reserve Mining Company.

MR. FRIDE: Thank you, Mr. Badalich.

Mr. Chairman, members of the conference, ladies and gentlemen.

The engineering plan to be presented today is now in the hands of the conferees, through the Minnesota Agency, as well as the text of the statements which will be made presenting the plan.

At this time, Mr. Chairman, I would move that they be made a part of the record.

MR. STEIN: The engineering plans will be made a part of the record.

I am looking at the document. I think in view of the importance of this plan, we will try to reproduce it as presented. We may have a problem --

MR. FRIDE: We have a number of copies, Mr. Chairman.

MR. STEIN: I am just talking of the evidence. We may have a problem of getting this reproduced in color.

MR. FRIDE: I see.

MR. STEIN: But I am going to try. Now, I do know from looking at your pictures in this document that they are not going to reproduce.

Mr. Fride, do you think you can get us better copies of the photographs that are contained in this report?

MR. FRIDE: I am sure we can, Mr. Chairman.

MR. STEIN: If you can, we will try to get them --

MR. FRIDE: Very good.

MR. STEIN: -- reproduced, and this will be made a part of the record as if read.

Thank you.

MR. FRIDE: Thank you, Mr. Chairman. Yes, we will do that.

(The above-mentioned document follows in its entirety.)

Plan to Modify Tailings Discharge System

RESERVE MINING COMPANY
Babbitt and Silver Bay, Minnesota

WHAT IS RESERVE MINING COMPANY?

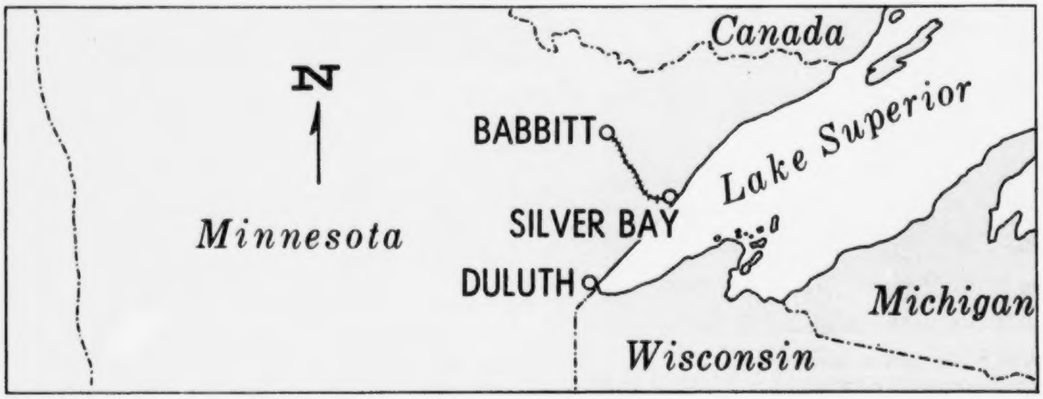
Reserve Mining Company is a Minnesota corporation and all its officers and employees are Minnesota residents. Reserve produces merchantable iron ore in the form of pellets from Babbitt taconite, a hard, gray rock in which are imbedded fine particles of magnetite, a black magnetic oxide of iron.

Mining is done at Babbitt, Minnesota. After primary and secondary crushing the crude taconite is transported on Reserve's 47-mile intraplant railroad to the processing plant at Silver Bay, Minnesota, on the north shore of Lake Superior.

Since beginning operations in the 1950's, Reserve provides 15% of the U.S. iron ore used in America's blast furnaces. Reserve pioneered the process which successfully frees iron-bearing particles from the lean, dense taconite. Reserve was the first company to demonstrate on a commercial basis —at an investment of $350 million—that iron ore from taconite could become a high grade feed for the nation's basic steel industry.

Twenty years ago much of the easy-to-work natural ore had been mined out or approached depletion due to the demands of World War II and a growing American industrial economy. The nation's steelmakers began to look elsewhere for ore: South America, Africa and Canada.

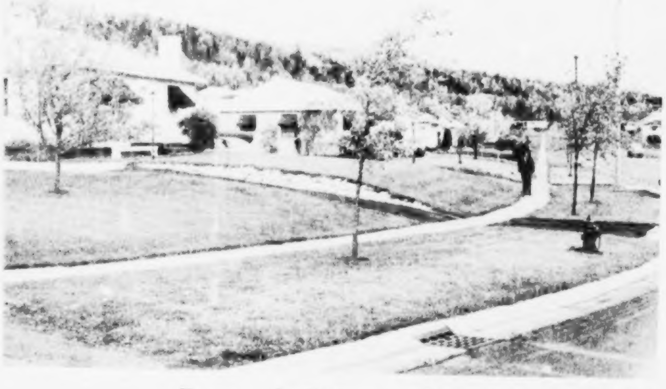
However, a virtually unlimited supply of taconite remains on the Mesabi and Reserve's pioneering work pointed the way for converting it to usable iron ore. Today, six companies in Minnesota produce pellets in taconite operations similar to Reserve's. Yet, Minnesota has no monopoly on this business. Taconite of similar or substantially better quality is found in large areas of eastern Canada as well as on some of the iron ranges in Michigan and Wisconsin. Competition from these sources cannot be ignored in any consideration of Reserve's operations.



Reserve also is people—3,200 employees whose lives and fortunes are tied to the company. More than 9,000 people also are employed by the five other companies who now mine and process taconite in Minnesota. Thousands more work for the businesses which furnish the $110 million worth of materials, supplies and equipment used by these taconite producers. One industry observer estimates that four to six persons are supported in non-mining jobs for every employee in the mining industry.

In 1969, Reserve's payroll was $31,700,000 and the company's state and local taxes paid totalled $4,250,000. Materials and supplies purchased that year totalled $27,400,000. During the most recent three years of operations, the company realized an average annual net profit per ton of ore produced of $1.58 and a 4.41 per cent return on investment. Present outstanding indebtedness is approximately $144,000,000.

Reserve also is Silver Bay and Babbitt, Minnesota—two new cities carved out of the wilderness to become model communities. Both boast superb schools, modern homes, a variety of recreational facilities. Teachers, independent businessmen, bankers, merchants and professional men prosper with the growth and development of the taconite process.



Reserve built two modern cities to provide pleasant homes for employees. Babbitt and Silver Bay have a combined population of 9,000. Virtually all homes are privately owned.

Reserve recognizes the need for maintaining a proper balance between its industrial responsibilities and a respect for natural resources. While the company believes that much of the public criticism of its operations with respect to Lake Superior is unfounded, it is anxious to relieve this concern to the maximum extent that is practical and feasible.

Part of Silver Bay, home of about half of Reserve's 3,200 employees. Annual payroll, including fringe benefits is over $30,000,000.

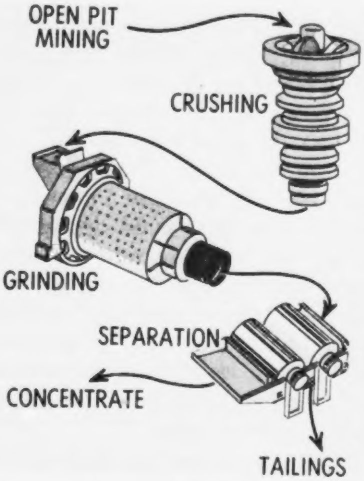
View of Babbitt. Like Silver Bay it is a well-planned, self-governing model community with modern schools, churches, water and sewage plants, recreation areas, and shopping centers.

WHAT IS TACONITE?

With the decline of the natural ores, the once-great Mesabi felt the pinch. As the region's economy faltered, unemployment soared and people began to leave the area. Duluth and other cities serving the Range also were hard-hit. There were widespread fears that the region might become another Appalachia.

Despite efforts by a few far-sighted individuals who labored to find a practical way to use taconite as a source of iron ore, the future looked grim. A plant, built at Babbitt in the 1920's to process taconite, failed and that community became a ghost town.

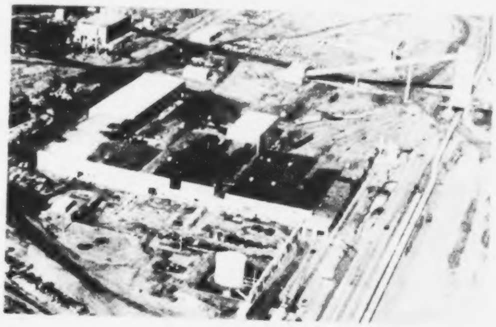
Nevertheless, this abrasive rock—hard enough to scratch glass—continued to tantalize a few dedicated engineers and scientists. It contains 18 to 25 per cent iron but that iron is finely disseminated throughout the stubborn rock.



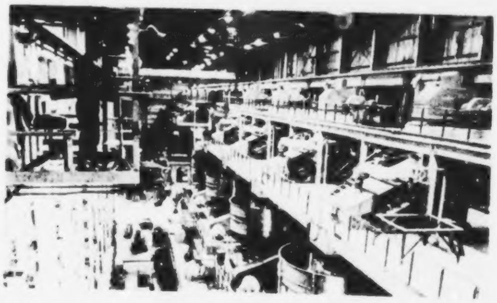
After taconite is crushed and ground, iron-bearing particles are captured by magnets. Iron-bearing particles are called "concentrate". Particles not attracted to magnets are called "tailings".

The taconite process is complex and expensive. Huge complicated machines are needed. Plants costing hundreds of millions of dollars are necessary.

Reserve crushes and grinds taconite and separates the iron ore from the resulting sand by powerful magnets. The iron ore is then rolled into marble-size balls which are fired to make them hard enough for shipment down the Great Lakes to the steel mills. The non-magnetic crushed rock or sand that is rejected in this process is called "tailings". In Reserve's case, the processing plant could not be located near the mine at Babbitt (the common practice in mineral dressing) because there is not enough water nearby to supply the huge quantities needed in the process. Also, there is not sufficient low-lying land available near Babbitt for disposal of the large amount of tailings created in the process: three tons of taconite must be mined to produce one ton of iron ore concentrate. Reserve produces about 60,000 tons of tailings daily and about 30,000 tons of pellets.



Reserve's taconite is crushed to about 3-inch pieces and loaded into rail cars at Babbitt. Complex of buildings in foreground is maintenance shops for mine equipment.



After being delivered by rail to Silver Bay, taconite is crushed to smaller pieces, 3/4" or less. Crushed ore is then conveyed beneath U. S. Highway 61 to concentrator building.

RESERVE'S PERMITS

Before Reserve built its plant at Silver Bay, the company sought state and federal approval to deposit its tailings into Lake Superior. Thorough investigation showed the inert sand—virtually insoluble in Lake Superior water—would in no way harm the lake, its fish or aquatic life. Permits were issued to Reserve by the Minnesota Water Pollution Control Commission (now known as the Minnesota Pollution Control Agency) and the Minnesota Department of Conservation on December 18, 1947. Subsequently, amendments were added following more hearings on July 6, 1956 and September 29, 1960. Among other provisions the following is included in both permits:

"(d) Such tailings shall not be discharged so as to result in any material clouding or discoloration of the water at the surface outside of said zone except during such time as turbidity from natural conditions in the adjacent portions of the lake outside of said zone may be caused by storms, nor shall such tailings be discharged so as to result in any material adverse effects on fish life or public water supplies or in any other material unlawful pollution of the waters of the lake or in any material interference with navigation or in any public nuisance outside of said zone."***

"(i) The permit shall be for a term extending without limitation until the permittee shall surrender the same, or until revocation as hereinafter provided."

"(k) The permittee shall allow the commissioner of conservation or his agents (or Minnesota Pollution Control Agency) or successors in authority access to and inspection of the permittee's plants, premises, and operations under the permit at all reasonable times for the purposes of investigations and studies of the effects thereof on the interests of the public, and shall cooperate in such investigations and studies."

"(l) The permit shall be subject to revocation only for violation of the conditions hereinbefore set forth. Before any such revocation the commissioner of conservation (or the Minnesota Pollution Control Agency) or his successor in authority shall hold a public hearing upon charges specifying the alleged violation, of which at least thirty days' notice in writing shall be given to the permittee, and if such violation can be corrected the permittee shall be given a reasonable opportunity to correct the same."

Representatives of the Corps of Engineers of the United States Army attended all of the comprehensive State Permit hearings and thereafter gave extensive consideration to Reserve's Permit application. The Corps issued a Permit to Reserve on April 22, 1948. This was subsequently amended on April 14, 1950, July 23, 1952, August 12, 1960 and on October 11, 1960 to "permit deposition of tailings into Lake Superior for an indefinite period," i.e., for the life of the plant. The Federal permits have never specified any limitations on the quantity of tailings to be deposited in the lake or included any other provision with respect to effects on the lake except to state that there should not be "unreasonable obstruction to the free navigation of said water." The permits do not contain reference to or any authorization for any "revalidation" proceedings.

In reviewing the extensive hearings held before the State permits were issued, the then chairman of the Minnesota Water Pollution Control Commission and Commissioner of Conservation stated:

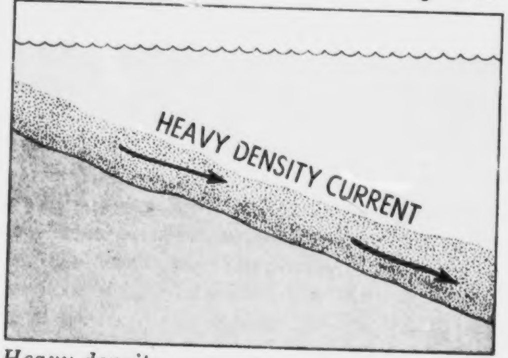
***"Our answer is that on the basis of all the evidence in the case, not only all the members of the Water Pollution Control Commission and the staff of the conservation department but a great many other sincere and impartial conservationists are convinced that the project is in accordance with a sound, long-range program for conservation of both iron ore and water resources, that it will do no material harm to public interests in the lake, and that on the whole it will be in furtherance of the best interests of the state."

***"We also gave the officials of the Wisconsin Conservation Department and the Wisconsin Water Pollution Control Commission ample opportunity to study the case, and offered to bring in at our expense any additional witnesses they might suggest and to make any additional investigations they considered desirable. They concluded that no further evidence was necessary, and issued statements to the effect that they had no objections to the project.

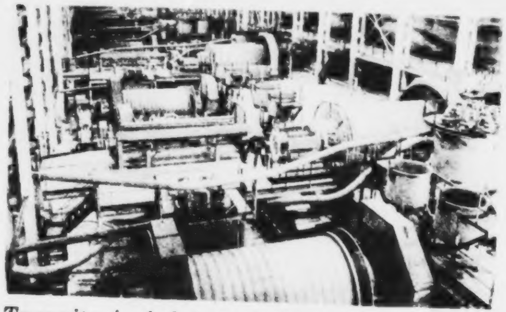
"The project was also passed as unobjectionable by the U.S. Fish and Wildlife Service, the state Executive Committee of the Izaak Walton League, the Governor's Conservation Advisory Committee (by a substantial majority), and the Minnesota Emergency Conservation Committee."

***"In fact, in order to be prepared to enforce the very strict conditions which we have imposed in the permits granted to the company to protect the lake against pollution, injury to fish life, or other harm to the public interests, the conservation department and the Water Pollution Control Commission already have under consideration the setting up of systematic and continuous investigations of conditions, both before and after the project gets under way, and we will do this whether investigations are made by anyone else or not."

Granting of the permits was influenced by a natural phenomenon known to scientists and hydrologists as a "heavy density current" which forms when enough solid material is suspended in water to make it heavier than the surrounding or receiving water. This current flows directly to the bottom carrying the suspended particles with it. Then, always seeking the lowest level, the heavy density current flows like an underwater river along the lakebed to a deep trough. About half of the tailings—the coarser fraction—settles out promptly and has formed a sand beach called the delta in front of the plant. The finer portions flow off this beach into the lake forming a heavy density current. Tailings settle from this density current as it flows along the bottom. The finest tailings reach and settle in a 600-to-900-foot deep trough which parallels the north shore. This trough is so large that all the tailings from the entire orebody Reserve intends to mine could be deposited there; the bottom of the trough would be raised only an average of two feet.



Heavy density current carries tailings to lake bottom because tailings-laden water is heavier than lake water.



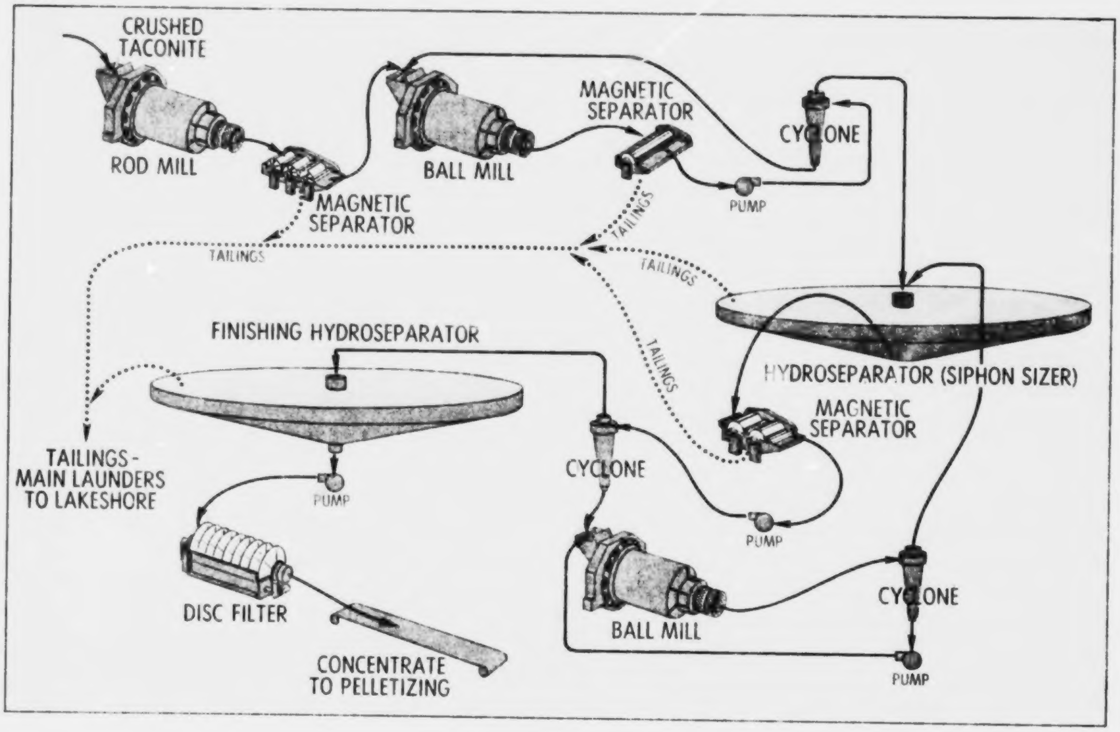
Taconite is fed to grinding mills. Water is added. Tumbling steel rods or balls grind the rock in order to free iron-bearing particles from tailings (sand).

EXPLANATION OF CONCENTRATING PROCESS

Reserve's tailings result when iron ore particles rich in iron oxide are separated from those that are very lean or barren. The lean or barren portions are the tailings. Under the present system this separation or mineral beneficiation is performed in three stages of grinding and five steps of separation. The taconite is prepared for grinding by crushing to 100% minus ¾-inch in size which is then fed into rod mills. The first separating—magnetic separation—is then performed. Separation is made at a very coarse size, some particles being as large as ⅝ of an inch. This first separation step produces approximately 63% of the total tailings.

Next, the iron rich product is fed into ball mills which grind the material to an intermediate size. Following the ball mill grinding, the second step of magnetic separation is performed. At this intermediate size, some tailings particles are as large as $\frac{3}{32}$ of an inch. This second separation step is the source of approximately 27% of the total tailings.

Following this magnetic separation, the iron rich portion of the material is separated according to its particle size. The particles too large for further processing are returned to the ball milling operation. The proper size material is fed into the third and fourth stages of separation. The third step is a hydraulic separation step in which the heavier iron rich particles sink in relatively still pools of water and the low iron content particles are caused to overflow as a tailing. Approximately 7% of the total tailings originate at this point.


CRUSHED TACONITE
ROD MILL
MAGNETIC SEPARATOR
BALL MILL
MAGNETIC SEPARATOR
CYCLONE
PUMP
TAILINGS
TAILINGS
TAILINGS
TAILINGS
FINISHING HYDROSEPARATOR
HYDROSEPARATOR (SIPHON SIZER)
MAGNETIC SEPARATOR
TAILINGS - MAIN LAUNDERS TO LAKESHORE
PUMP
CYCLONE
PUMP
DISC FILTER
BALL MILL
CYCLONE
PUMP
CONCENTRATE TO PELLETIZING

s in making taconite concentrate. Not shown: mining and crushing es which precede grinding, pelletizing phase which follows separation.

From this hydro separation step, the iron rich portion of the material is fed into finisher magnetic separators, the fourth separating step. Here approximately 2.5% of the tailings originate. The iron rich material is then pumped to another step of separation by particle size. The large particles are fed into the third stage of grinding, a ball mill operation, where they are ground to the proper size and returned to the hydro separation step described above. The proper size particles are fed into the final, or fifth, stage, another hydro separation step. The heavier iron rich particles settle to the bottom of a rather still pool of water and are pumped out as a final product. The lighter low iron bearing particles are caused to flow over the top of the receptacle and are discharged as tailings. This step only accounts for approximately one-half of one percent of the total tailings generated. The tailings generated in these last three steps of separation are all approximately the same size, the largest being approximately one-hundredth of an inch.

All these grinding separation steps are performed with solid material suspended in water. The tailings are all joined together from each step of separation and then are transported down a system of launders, or troughs, as a slurry approximately 3.5% solids. Reserve has twenty-two concentrating sections in operation feeding tailings by gravity through two main launders to the shore. The tailings originally discharged at the shore from each of these launders have formed a beach or delta. The very coarse fraction settled first to form this beach. The fine fraction of tailings flow across this beach and enter the lake as a slurry approximately 1.4% solids. This tailing slurry then forms the heavy density current, previously described, which carries this fraction of the tailings on to the deep lake bottom.

THE CONTROVERSY

Much of the impetus for the present controversy about Reserve's deposition of tailings in Lake Superior resulted from widespread distribution of an article by Louis G. Williams, a former employee of the Federal Water Pollution Control Administration, once assigned temporarily to the Duluth area, asserting that the tailings were having a deleterious effect on the Lake. The Williams article and the various letters addressed by Williams to governmental and other officials throughout the nation were reviewed later by Dr. Donald Mount, Director, Federal National Water Quality Laboratory of the Federal Water Quality Administration. On January 26, 1968, Dr. Mount wrote Williams:

> ***"I readily admit that I called your report irresponsible and I still stand by that conclusion until I can find reason to change it. I would like to be in a position to evaluate your report objectively and fairly but you have not made that possible to date. This is my last attempt, I believe, to try to understand the basis for your conclusions."***
>
> ***"But, Lou, this is a fact of life that you cannot publish conclusions until you can furnish the data to support them and that is all I am asking you to do---show me the actual data that you have collected which are strong evidence that there is a cause and effect relationship between deterioration of Lake Superior and pollution sources. Further, furnish the data which are evidence that the deterioration now (presumably this will be based on algae populations, animal population, etc.) is due to pollution and not to natural aging of the lake."

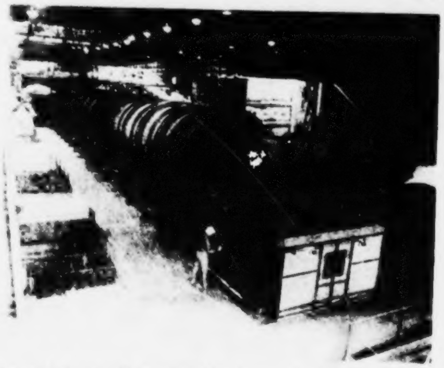
Further fuel was added to the controversy in 1968 by the premature and unauthorized release of a so-called "Summary Report" by Charles Stoddard, then employed by the Department of Interior, of his conclusions relating to Reserve's discharge.

The preliminary background information prepared for the Stoddard study group was essentially accurate in reporting that:

> "There is a very deep trough in Lake Superior 10 to 15 miles in width extending

from about Two Harbors beyond Grand Marais. This deep trough is very close to the north shore of Lake Superior in the vicinity of Silver Bay. At the site of the plant the depth of the water immediately along the line of the breakwater of the harbor runs to between 130 to 150 feet. It continues to slope down rapidly so that a half-mile to a mile it reaches depths of 500 feet and more, and at approximately five miles from shore the depth will be approximately 900 feet.

"The studies conducted for Reserve Mining Company demonstrated that a current would be established by their discharge that would tend to follow the slope of the bottom of the lake and would carry the tailings into the deep trough. This current would be created because of the higher density created by the tailings held in suspension. The tailings would then spread out along the deep trough which has the capacity to absorb many times the total amount which will be deposited from the operation. The coarser portion of the tailings will be deposited on shore of the inlet into which they are discharged and the finer material will be carried into the trough and settle on the bottom. The company pointed out a minute fraction (about two-tenths of 1%) would remain in suspension for a longer period of time. This material, however, would eventually settle out."***



Concentrated taconite is rolled into pellets, which are fired to make them hard enough to withstand shipping. Shown is one of eight furnaces.

"There have been a great number of studies and reports relating to the establishment of the Reserve Mining Operation at Silver Bay. These studies have dealt with preoperational surveys of the plant devoted to gathering background information on the lake, the effects of the density currents and post-operational surveys of the taconite plant measuring its effect upon the lake."

"Most of the investigations have been conducted by the Minnesota Department of Health for the Water Pollution Control Commission, the Minnesota Pollution Control Agency, (formerly the Water Pollution Control Commission), the Department of Conservation, and the University of Minnesota School of Public Health. In summary, the reports concluded that no evidence of pollution or serious harmful effects of any kind have resulted from the discharge by the Reserve Mining Company's Silver Bay operation."

However, the Summary of conclusions publicly released by Stoddard in December, 1968—to the effect that Reserve's discharge had an adverse effect on Lake Superior—have been the subject of vigorous disclaimers by responsible officials.

In a Memorandum prepared by John Badalich, Executive Director, Minnesota Pollution Control Agency, dated January 20, 1969 he stated:

"The next meeting of the Department of Interior Taconite Study Group was held on September 5-6, 1968, at which time draft copies of various Interior Agency reports were presented to our staff and several comments were made that these reports, particularly the one on water quality were very biased and would be subject to much legitimate criticisms if presented or shown. Of particular concern were the sampling methods and the weight put on questionable samples, the combining of surface, mid-depth and bottom sampling data in the discussion of findings and the manipulation of numbers to demonstrate a preconceived notion of the situation."

"It became apparent at the September and October meetings of the Department of Interior Taconite Study Group that the findings of these studies by the Interior presented very little information of any consequence not already available from previous State studies. It also became apparent that what this group could not demonstrate by measurement, analysis and observation was being handled by speculation and conjectures designed to arouse public concern.

"It is very difficult for a state agency responsible for water quality and pollution control to take a stand in opposition to a Federal agency with the same responsibilities because it has the inevitable effect of placing this agency at least in the public's eye on the side of the discharger. There appears to be no defense against this anomalous situation except to point out that enforcement action must be supported by the hard facts of the situation and not by speculation and conjecture. The facts regarding damage to the lake or its uses are not supported by the evidence and it is very unfortunate that this preliminary draft of the Interior report was prematurely released. The public statements of the inaccuracies in the report which were made by high ranking officials of the Department of the Interior following its release probably will accomplish little in the public's eye toward withdrawing the report's initial impact even though it was admittedly in error."

In a letter dated November 25, 1969 from Federal Water Pollution Control Commissioner Dominick to an interested U. S. Congressman, the Commissioner said:

"This report was never distributed, so we have reproduced a copy from our files. I would like to stress, however, that this summary (the so-called 'Stoddard report') was not released as an official Department of the Interior publication because of technical questions and because the report was superseded by the Lake Superior Enforcement Conference which made a more authoritative review of the matter. We have, of course, been reluctant to distribute a preliminary report that we could not fully defend technically."

"Prior to full evalution by the agencies involved, Mr. Charles Stoddard, then Interior Regional Coordinator in the area, sent a copy of the summary report to the Corps of Engineers. At the same time, the Federal Water Pollution Control Administration was following up on its earlier studies in preparing for a comprehensive conference on the water quality problems of Lake Superior that would cover Reserve Mining Company, among other dischargers."

"Thus, the Stoddard report was sent to the Corps without having first been evaluated technically by Federal Water Pollution Control Administration scientists in Washington. When the summary was reviewed by the technical staff of this agency, there was concern that certain findings and recommendations might not be fully supported in all respects by a critical scrutiny of the data accumulated by our field personnel."***

GOVERNMENT LAKE STUDIES

While their studies have not received the widespread publicity generated by the Williams and Stoddard statements, responsible authorities of the Minnesota Pollution Control Agency, the Minnesota Department of Health, the Minnesota Department of Conservation and the University of Minnesota for many years have carefully scrutinized possible present and future effects of Reserve's discharge.

In 1959 the Minnesota Department of Health reported:

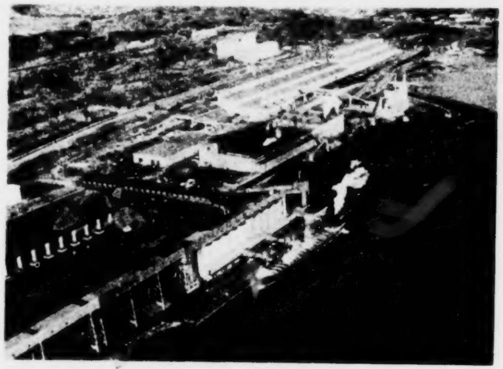
> "There is some indication from the results of analysis of the bottom samples that the deposit of taconite tailings is slowly expanding both out into the lake and down the shore from Silver Bay. The presence of the tailings in the bottom sediments does not in itself appear to be related to any detrimental effect on the lake and its uses."
>
> ***"The 'green-water' condition does not appear to be any more extensive or severe than in other years, despite the continued discharge of tailings into the lake. This indicates that the very fine particles are being continually removed from suspension either by sedimentation alone, or in combination with other natural factors, and do eventually settle on the lake bottom."

In 1967 the Minnesota Pollution Control Agency stated:

> "The presence of suspended solids in the sub-micron range may explain the color change of water in certain areas, even though the quantity of material present was not great enough to change the turbidity. This effect is produced by scattering of the shorter light waves which on reflection yields a slightly different color. The same kind of effect has been noted in many other areas at times, and can be produced in very clear waters in a state of nature by natural run-off."

In 1968 the Director of the Minnesota Pollution Control Agency reported to the Minnesota Governor:

> "The hearing dealt primarily with Reserve Mining Company's taconite operation at Beaver Bay, and the deposition of taconite tailings into Lake Superior. To date there is no conclusive evidence that these tailings are impairing the water quality of the lake other than speculation on the part of some that any unnatural deposit into a body of water creates pollution, even though the material is of the same general character as surrounds the lake."



Taconite is concentrated and formed into pellets at E. W. Davis Works at Silver Bay. This is the world's first, and largest taconite plant. It ships one-third of Minnesota's total taconite pellet production.

Pursuant to an order by then Interior Secretary Udall on January 16, 1969 a Conference was convened under Section 10 (d) (1) of the Federal Water Pollution Control Act. This Conference has considered the possible effect of Reserve's discharge.

In 1969 the Director of the Minnesota Pollution Control Agency advised the Conferees of the Lake Superior Enforcement Conference that:

> "Minnesota has done a considerable amount of water quality sampling, monitoring and studying of Lake Superior. The Minnesota Pollution Control Agency has conducted many studies prior to and subsequent to Reserve Mining's operation and have found the waters of Lake Superior to be of excellent quality."

The Minnesota Commissioner of Conservation reported to the same Conference:

> "The Conservation Department has been involved in many of the studies made of the plant and any effects it may have on Lake Superior and has cooperated with State and Federal agencies and Reserve Mining Company in evaluating and analyzing results of the many studies made."***

"Our studies of the record and of the lake indicate that present taconite operations do not currently have an appreciable effect on fish production in the lake."

On December 5, 1969 Dr. Mount, Director, National Water Quality Laboratory, Duluth, reported to the Assistant Secretary of the Interior in a document entitled "Summary of the Essential Factors regarding Reserve Mining Company":***

"A minor, but unknown, percentage of the tailings is carried by some mechanism to more distant points in the lake. Taconite does occur in Wisconsin waters as a very thin, discontinuous layer on the bottom and is mixed with natural sediments."

"There is no data to suggest damage to water quality or aquatic life in Wisconsin water."

"There is very doubtful evidence of material damage to aquatic life in Minnesota waters.

"The solution rate of the tailings is extremely slow, the actual rate has not been measured.

"The effect of natural flocculants on the flocculation of tailings has been ignored.

***"THE BASIC PROBLEM. Some percentage of the fine materials less than a few microns in diameter does not settle in front of the plant but is transported for considerable distances in the lake before being deposited on the bottom (or dissolving?).

***"Especially at certain seasons of the year, bands or patches of green water appear near or contiguous to, the discharge point at times when green water is not visible from natural sediment discharged by tributaries.

"There have been drastic changes in the fish populations of the lake due to factors unrelated to taconite. This has sensitized the public and made them search for a cause."

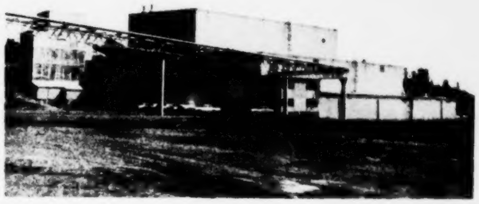
***"There is weak evidence to support a very minimal effect on the lake itself in the near vicinity of the discharge."

In a report released in May, 1970, dealing with the "Investigation of Water Quality of Lake Superior in the Vicinity of Silver Bay" the Minnesota Pollution Control Agency concluded:

"The investigation was for the purpose of determining if the water quality in and around the Reserve Mining Company permit area was being affected by the discharge of taconite tailings, and to provide current information for comparison with the results of similar surveys done in 1948, 1953, 1955, 1958 and 1966."

"CONCLUSIONS 1. The overall water quality of Lake Superior at the time of the survey in the vicinity of Silver Bay was found to be excellent at all sampling stations.

"2. No significant difference was found in the quality of the water outside of the Reserve Mining Company permit area and that inside the area at the time of the survey, except for the 5-day biochemical oxygen demand which was significantly higher outside the area. These higher values are probably attributable to the rivers flowing into the lake south of the permit area."



Research and Development Center at Silver Bay, where scientists and engineers seek ways to improve pellet quality, monitor Reserve's use of water and tailings disposal.

The staff of the National Water Quality Laboratory has conducted many studies of Reserve's taconite tailings and Lake Superior commencing in 1968. In reviewing and summarizing those studies Dr. Donald Mount, Director of the National Water Quality Laboratory, stated to the Lake Superior Enforcement Conference on April 30, 1970:

> "In my judgment the effect of Reserve's discharge should be assessed in terms of altering the Lake's appearance rather than the toxic effect on fish and fish food organisms, or endangering water supplies."

Subsequent to several sessions of the Lake Superior Enforcement Conference, the Conference Chairman, who is also the Assistant Commissioner for Enforcement of the FWQA, stated one of his recommendations for a resolution of the controversy:

> "One of the additional recommendations would ask Reserve Mining to engage individual consultant engineers to prepare a report to be submitted to the conferees in six months which would develop and propose a method of either removing that portion of the taconite fines which tend to drift across the lake or so treat the fines that they will remain in the immediate area of discharge."

The Lake Superior Conference, consisting of Conferees from Minnesota, Michigan, Wisconsin and the Federal Government has met on May 13-15, 1969, September 30, October 1, 1969, April 29-30, 1970, and August 12-13, 1970.

At the most recent session the Conferees requested Reserve Mining Company to provide a plan for a specific alternative method for handling tailings to the Conferees through the Minnesota Pollution Control Agency. The Conferees would then again convene to see if the alternative was acceptable. The Conferees also recommended that Reserve provide to the Conferees through the Minnesota Pollution Control Agency detailed plans and specifications for accomplishing the remedial program by September 1, 1971.

Responsive to that request, Reserve will formally present to the next session of the Conference, scheduled to convene on January 14, 1971, its Plan to modify the discharge which is included herein.

COURT TRIAL

In other proceedings, Reserve Mining Company and the Minnesota Pollution Control Agency engaged in a Minnesota State District Court trial conducted by Judge C. Luther Eckman from June 22 through August 5, 1970 involving the question of whether certain interstate water quality standards adopted by Minnesota were reasonable as applied to Reserve and also whether Reserve was in violation of such standards or was violating the stringent requirements of the Minnesota Pollution Control Statutes. Some 29 witnesses testified during that trial including Dr. Robert Barr, chief executive officer of the Minnesota Board of Health, who stated:

> "Dr. Barr: Well, my opinion is that the discharge has had no effect whatsoever on the lake. For consumption of water in any of the places where we find communities that are taking water from Lake Superior we found no evidence there that tailings had any effect whatsoever."
>
> ***"Mr. Fride: Would you state, Doctor, whether you have an opinion—and perhaps this is the same area—as to whether or not Reserve's tailings have an adverse effect upon the health of Minnesota citizens based on your best judgment?
>
> "Dr. Barr: Based on my best judgment I would say they do not."

Dr. Mount testified:

> ***"Mr. Truhn: In 1967, you indicated that you first became aware of Reserve's discharge, what was your initial reaction to the description of that discharge?
>
> "Dr. Mount: Well, I felt that any discharge that large and that big couldn't help but have a very bad effect on the Lake. This was my first reaction without having seen it or even knowing very much about it.
>
> ***"Mr. Truhn: Did your opinion then

change as you began to investigate it?

"Dr. Mount: Yes, it did. The first and very crude preliminary bioassay that we did in which we put fish in 100% effluent and they seemed to be happy for several weeks was quite an eye opener to me and made me realize that this discharge did not have the same toxicity as the discharges that we normally use or work with and so as we were unable to show direct toxic effects from the two different organisms that we studied and particularly when we were not able to find toxicity from some of the concentrations of metals that should have been toxic. My position changed considerably and I began to wonder if there were any effects at all."

After reviewing all of the evidence and arguments, Judge Eckman on December 15, 1970, issued his decision. He concluded, among other things:

* * *

"This Court feels that the time has come to brush aside all legal technicalities and procedures that may impede a resolution of these questions without further delay by taking the problem out of the public and political arena into the court for a full and comprehensive judicial review, where the interests of both the public and industry can be fully explored and protected."

* * *

"Probably no other trial in the history of this State has produced a more impressive array of scientists and experts expounding on their particular fields of expertise. With few exceptions, each had degrees showing years of education, series of publications and memberships on national and international committees and government commissions, together with years of experience in their respective fields of ecology and limnology (including chemistry, bacteriology, biology, etc.), sociology, economics, and cost accounting."

* * *

"The immediate application or enforcement of WPC 15, Subd. (c)(6) against Appellant (Reserve) would be unreasonable arbitrary, and capricious, and requires the granting of a Variance excusing Appellant from conformity thereto until the further Order of the Court, pursuant to subsequent modifications in the discharge process hereinafter referred to."

* * *

"After 15 years of operations and discharge of tailings into Lake Superior by the Appellant, the evidence before the Court establishes that said discharge has had no measurable adverse or deleterious effects upon the water quality or use of Lake Superior insofar as its drinking water quality, any conditions affecting public health, affecting fish life or the reproduction thereof, or any interference with navigation."

* * *

"M.S. 115.01, Subd. 5, defines pollution as follows: 'Pollution means the contamination of any waters of the State so as to create a nuisance or render such waters unclean, or noxious, or impure so as to be actually or potentially harmful or detrimental or injurious to public health, safety or welfare, to domestic, commercial, industrial or recreational use, or to livestock, wild animals, birds, fish or other aquatic life.' In applying this statutory definition to the voluminous evidence, both oral and documentary, the Court concludes that there was lacking the required substantial evidence by Respondent to convince this Court that the discharge of tailings by Appellant, after 15 years of operation, had "rendered the waters unclean or noxious or impure thereby." The only exception of convincing quality was the increased display of the "green water phenomenon" and the disappearance of a proportion of the scud, a small shell creature which serves as a food for smelt and small trout. Although measurable, these conditions were of minimal significance or materiality."

* * *

"Lake Superior is now an oligatrophic body of water and enjoys the distinction of being one of the lakes with the highest quality of water in this hemisphere. This fact was conceded by the testimony of both parties. Neither is there any dispute of the fact that any material deterioration or depreciation of the present water quality cannot be tolerated. And so, even though there has been no substantial or convincing evidence of deterioration to date, the Court cannot disregard the numerous scientific opinions expressed to the effect that the present method of discharge constitutes a possible or potential source of pollution which, if continued over a long period of time, might result in the material deterioration of the water quality of Lake Superior."

* * *

"the present method of discharge of tailings from its plant at Silver Bay, Minnesota shall be altered and modified by Appellant Reserve Mining Company to the extent that the disposition of fine tailings into Lake Superior and the distribution thereof into areas outside of the so-called "great trough" is discontinued."

* * *

"Reserve Mining Company shall submit to Minnesota Pollution Control Agency on or before May 15, 1971, for its approval, such plans for modification as are necessary to accomplish the result set forth above. After such approval by Minnesota Pollution Control Agency, Reserve shall have two additional years in which to build, install, and put into operation such approved modified method of tailings discharge."

* * *

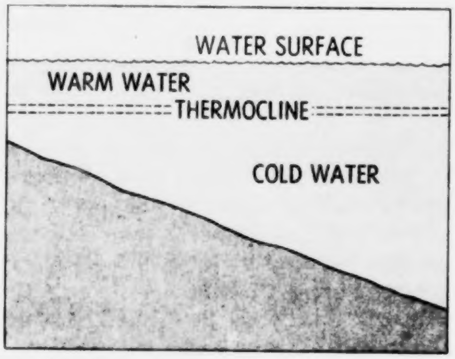
"In the judgment of this Court, any modification must insure the flocculation of the fine tailings and the deposit of all the tailings by conduit to the floor of the great trough, where they will remain, eliminating thereby their dispersion to other parts of Lake Superior, and elimination of complaints of aesthetic loss, net or shore slime, drinking water contamination, or eutrophication by increased algal growth. In support of this solution, the Court has gleaned from the Respondent's experts that the deposit of the tailings on the Lake floor in a relatively quiescent condition would substantially remove their apprehensions as to their effect upon the Lake's ecology, aesthetics, or navigation."

OTHER PROCEEDINGS

The Minnesota Pollution Control Agency and the Minnesota Commissioner of Conservation have scheduled hearings to determine whether Reserve is in violation of its permits. However, these hearings were temporarily enjoined until determination of the district court suit. In addition, the U.S. Army Corps of Engineers is presently conducting "revalidation" proceedings relating to Reserve's permits.

TOWARD A NEW PLAN

Occasionally, Lake Superior's waters (normally about 39° F. on the average) may have a thermocline—that is, a layer of warm water above the colder water of the lake. This condition can be caused by periods of unusually warm weather, surface currents which carry warm water from the shallows, or heavy summer rains or spring runoff from the shores.



Occasionally, "thermoclines" occur in Lake Superior . . . layers of warm water above the cold. Waters of different temperatures have different density. Thermoclines are known to hold sediments in temporary suspension.

Because of the difference in temperature, these layers have different densities. Some of the fine tailings—as well as tiny particles of natural sediments—can be entrapped at the point where the two layers meet. The particles are held in suspension temporarily. Also, when the heavy density current encounters a thermocline some of the finer tailings may "peel off" or detach from the plunging current and remain temporarily in suspension before settling. In such cases, these particles can be carried some distance from the zone of discharge by surface currents.

Light reflection from water containing such particles—or merely light refraction caused by the different density temperature layers—can produce what appears to be "green water" temporarily for a few hours or few days. It is not a true color. Subjected to prescribed color tests, the so-called "green water" is colorless just as is the surrounding "blue water" of the lake. The "green water" phenomenon is common in many lakes and in the oceans. Some people, however, consider this occasional appearance in Lake Superior objectionable to look at.

Others are concerned that tailings might be carried over a wide area of the lake rather than remaining in the deep trough or in the vicinity of the discharge. Still others fear that tailings particles provide a "platform" on which certain bacteria will grow or be transported, or that somehow the sand will contribute to the growth of algae thereby hastening the natural aging—eutrophication—of Lake Superior. Also, some observers believe tailings are harmful to certain species of bottom fauna, the tiny marine organisms on which fish feed.

Judge Eckman's decision should be reassuring to those who have expressed such concern since it was only in his courtroom that all of the pros and cons were aired by numerous witnesses including many of outstanding scientific reputation and integrity under appropriate rules where full examination and cross examination was permitted as well as a review of the files of the Interior Department, MPCA, Minnesota Conservation and Health Departments, and Reserve.

Reserve organized an engineering task force of experts—five engineering consulting firms skilled in this field—to investigate and evaluate proposals for the modification or alteration of the present disposal methods. Some 19 proposals were described and studied. These studies produced two progress reports in which each proposal was carefully evaluated from the following standpoints: workability, economic feasibility, and sound conservation.

The Company submits the following Plan in compliance with the Court's decision and in accordance with the recommendations of the Lake Superior Conference. It is submitted for approval by the appropriate regulatory agencies. It should answer the needs, hopes and desires of others who share Reserve's concern for the preservation of nature and yet enjoy the benefits of industrial progress.

ENGINEERING CONSULTING FIRMS:

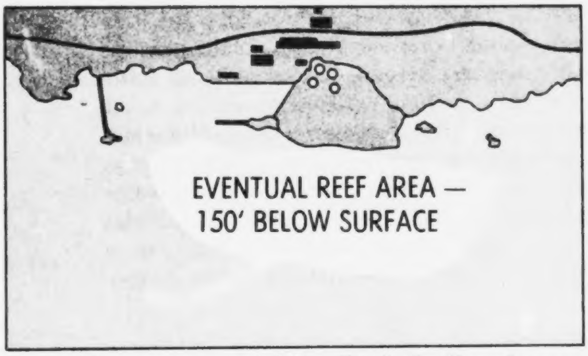
Bechtel Corp., San Francisco, California

Engineering-Science, Inc., Arcadia, California

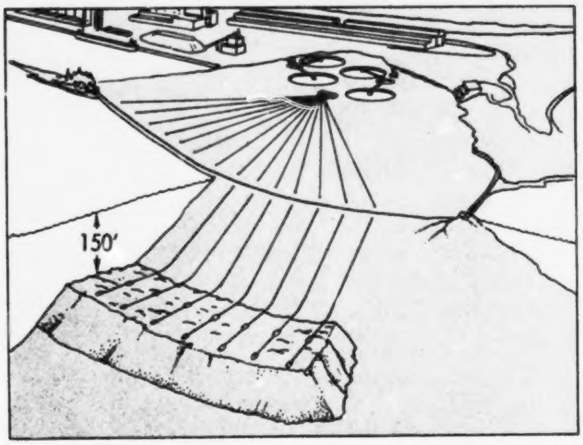
Arthur D. Little, Inc., Cambridge, Massachusetts

Parsons-Jurden Corp., New York

Trygve-Hoff & Assoc., Cleveland, Ohio



Green is present delta. Dark shading shows lake-bottom which will be built up to reef 150 feet below surface, 1.2 square miles in area. Reef formation will take 40 years to complete.



Cut-away drawing of underwater reef, showing pipes which will carry tailings to depths below influence of surface-affecting currents and thermoclines.

NEW PLAN FOR TAILINGS PROCESSING

This plan reflects many months of engineering and environmental consideration. In the interests of effective communication so that the concepts reflected in this engineering plan may be better understood, descriptions of equipment are provided. Detailed engineering before construction will involve analysis, under actual Lake Superior conditions, of the performance of such equipment and may result in some changes to achieve the objective, subject to agreement of the respective technical staffs as authorized by the regulatory agencies.

Under this plan, Reserve's waste sand (tailings) will be pumped far below the surface of Lake Superior where it will form an underwater sand reef 150 feet below the surface of the lake. The accompanying sketch shows the area of the lake bottom which will be raised to this depth during the balance of Reserve's planned mine life. It represents 1.2 square miles of the nine-square-mile zone of discharge specified in Reserve's permits.

Mammoth thickeners and hydroseparators and a settling agent will be used to create a thick slurry—as contrasted with the present discharge which is 98.6% water. Then the discharge will be pumped through 14 eight-inch pipes submerged far below any surface-affecting thermoclines, surface currents or wave action and form the underwater reef. The clarified water will be returned to Reserve's harbor at a point near the plant's existing process water intake.

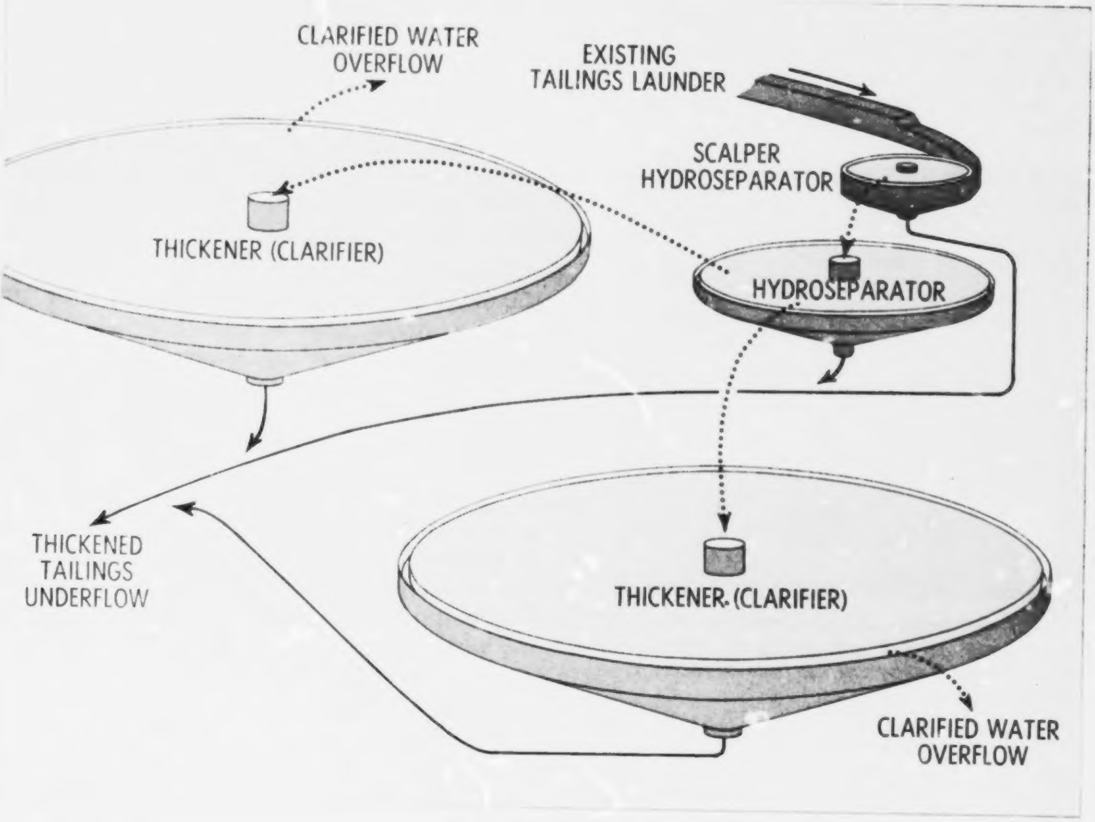
The estimated construction cost of the project is $14,000,000. Operating and maintenance costs, interest and principal payments on borrowed funds bring the annual average cash expenditure in excess of $2,400,000. There is no anticipation of any return on this large capital investment nor any improvement to the company's pellet quality by adoption of this plan. In total, over the next 20 years, the plan represents capital and operating expenditure commitments of $48,960,000 by Reserve for this additional tailings processing. In the light of the very substantial expenditures contemplated by this plan, cooperation of the appropriate agencies is solicited to assist in securing whatever assistance in the form of any funding or tax consideration that may be available.

The general arrangement equipment design is shown on drawings RM-202, RM-203 and RM-204 attached hereto. When approval is forthcoming further detailed engineering can begin immediately.

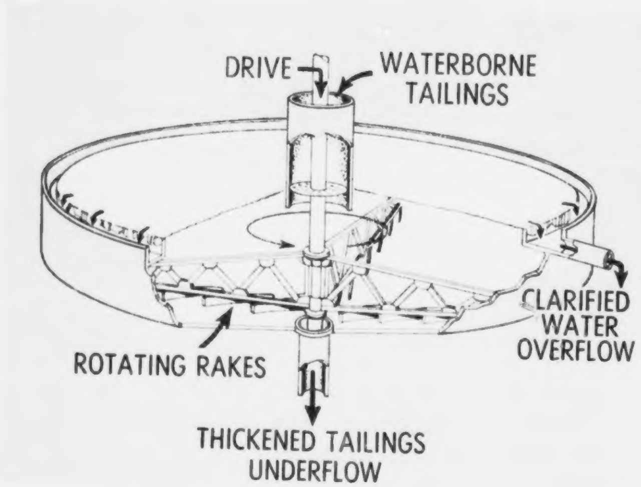
a

As shown on the diagrammatic flow sheet there will be two identical installations of thickening equipment, one for each of the existing launders (discharge troughs or flumes). Tailings will be carried by water to a 50-foot diameter scalping hydro-separator. This vat-like tank is the first stage of separation of the solids and liquid. Because the material is retained for only a comparatively short time in the scalping hydroseparators, only the larger-size particles will settle—pieces 14 mesh or larger, roughly the size particles that would not pass through the openings in an ordinary window screen. These particles settle to the bottom of the tank where circulating rakes move the material into a center drain. The finer material overflows the tank and into a second stage of separation: a 125-foot diameter hydroseparator which, operating like the first, will separate particles up to 150 mesh and pass the finer overflow on to two 310-foot diameter thickeners. Suitable coagu-

Before being pumped to reef formation area, most of water will be removed from tailings in giant thickener clarifiers. One-half of proposed system is illustrated.


CLARIFIED WATER OVERFLOW
EXISTING TAILINGS LAUNDER
SCALPER HYDROSEPARATOR
THICKENER (CLARIFIER)
HYDROSEPARATOR
THICKENED TAILINGS UNDERFLOW
THICKENER (CLARIFIER)
CLARIFIED WATER OVERFLOW

b



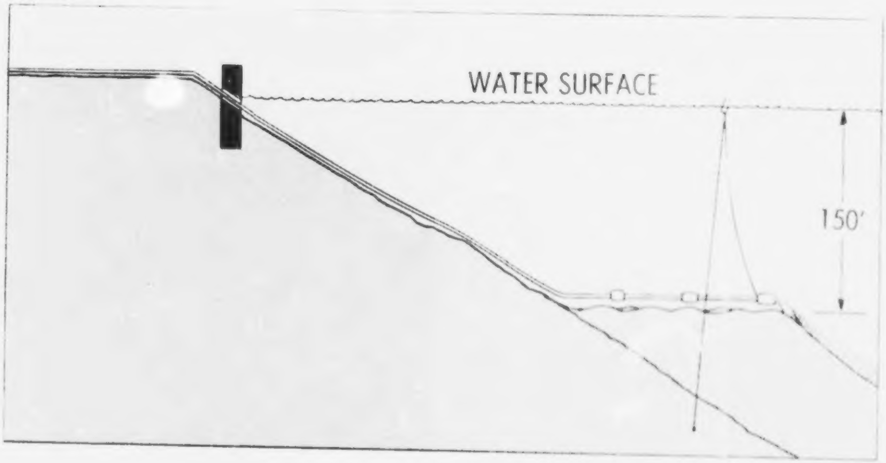
Showing how a thickener/clarifier works. Particles settle to bottom, are raked to center, clarified water spills over rim.

lants—settling agents—will be added to hasten particle settling and aid the water clarification process at each stage. The overflow from these four thickeners (two for each system) will be discharged as clarified water into Reserve's harbor at a point near the plant water intake.

The tailings underflow from the two scalping hydroseparators, two hydroseparators and from the four thickeners will be pumped to a pipeline pumping station. The material will be then pumped through 14 eight-inch diameter pipelines well below the surface of Lake Superior. Originally, two pumps will be installed in series for each pipeline. The number of pumps in series will be increased for each pipeline as the lines are extended to a maximum of five pumps per pipeline.

Each pipeline will be anchored at the edge of the present delta. A length of flexible wear-resistant rubber pipe in each line at the edge of the delta will permit a change of slope and direction necessary for proper entry. The pipes will follow the slope of the beach underwater to approach the 140-foot depth. There, another length of flexible pipe will again change the angle to the horizontal.

The pipelines are designed with buoyancy collars of polyurethane on the horizontal portion to make them 98 per cent buoyant when filled with water. For turning the pipes to distribute the wear by the coarse tailings, for replacement and for extension, the pipes must be cleared of slurry and a mixture of water and air pumped into them to bring them to the surface.



Fourteen pipes will carry thickened tailings to 140-foot depth. As reef grows, pipes are extended.

C

Tailings will build up on the lake bottom below the pipes to a depth of 150 feet below the lake's surface (see accompanying sketch). When this depth is reached in front of a pipe, water with sufficient air will be pumped into the line causing the pipe to rise to the surface. A work boat crew will then add an extension and the pipe will be re-submerged to the 140-foot depth by pumping water back into it.

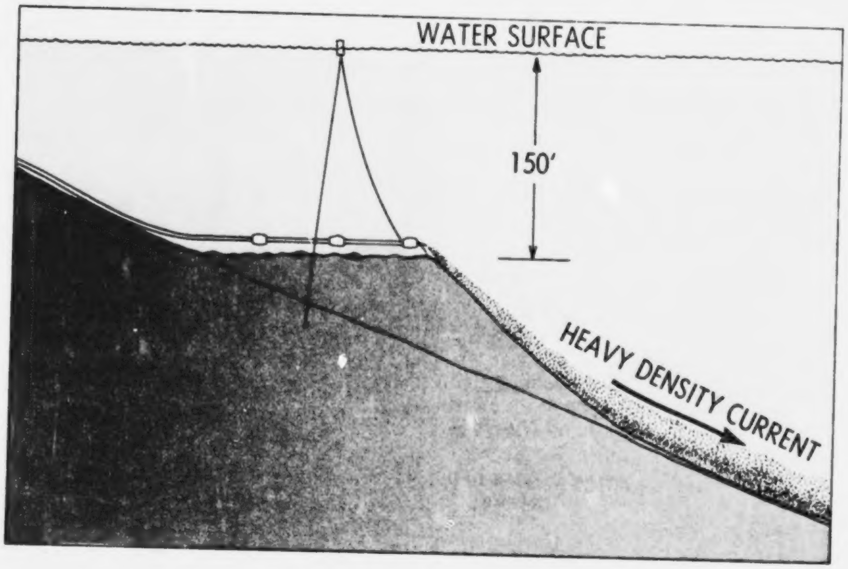
The end of each submerged pipe will be supported by a buoy which in addition to being a navigation aid will serve as a visual marker for maintenance boat crews. These buoys will be anchored to prevent the pipe from shifting position.

Since pipe wear is expected to be rapid, the pipes will need turning every six months and complete replacement every two years. The pipe extension, turning and replacement will be about one-third of the direct operating costs.

The coagulants or settling agents used will be those accepted by the U. S. Public Health Service and commonly used to clarify water by municipal treatment plants. The coagulant causes the fine particles of tailings to flocculate, or gather together in flocs which take on the settling characteristics of much larger particles thereby settling them much more rapidly in the thickeners. The coagulant will be concentrated on the solid tailings which are pumped from the bottom of the thickeners, causing these particles to settle more rapidly on the bottom of the lake when discharged from the pipes at the 140-foot depth.

20 YEAR COST FOR MODIFICATION OF TAILINGS DISPOSAL SYSTEM

	Total Expenditure
Labor, Material & Supplies to Operate and Maintain	$22,460,000
Interest	12,500,000
Principal	14,000,000
TOTAL	$48,960,000

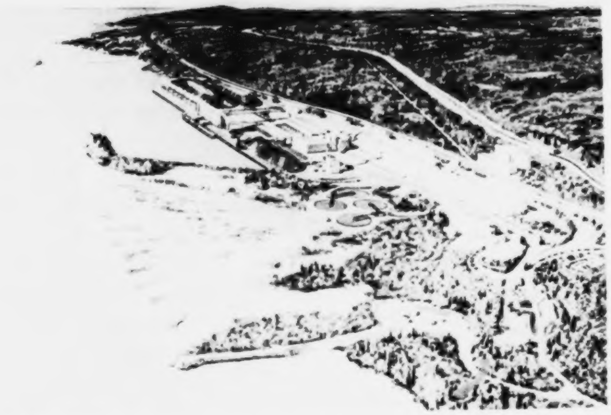


Heavy density current will continue to deliver portion of material to Great Trough.

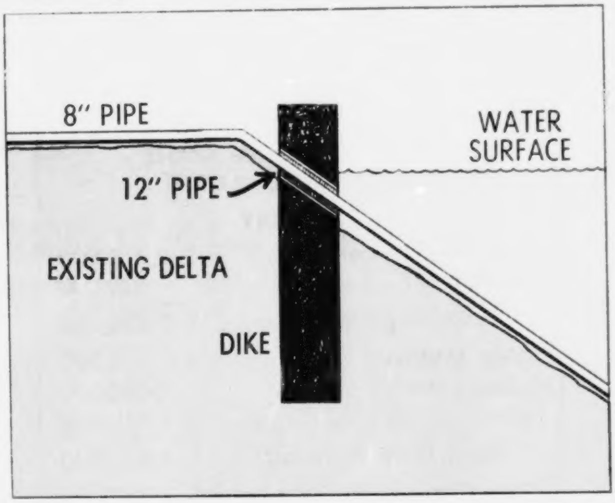
d

As is well known, a heavy density current forms when sufficient solid material is suspended in water to make the water-solids combination denser—heavier—than the receiving or surrounding water. At Silver Bay, the discharge water which is heavily laden with tailings flows by gravity from the plant to the lake across the delta which formed when coarser tailings settled out promptly. The fine tailings slurry (which is about 1.4% solids) forms a heavy density current which flows down the sloping lake bottom into the Great Trough.

Under this new plan, tailings will enter the lake forming a much more compact and stronger heavy density current than is now the case under the present discharge system. Larger particles will settle almost immediately. The finer particles will be flocculated and will settle more rapidly than the fine tailings from Reserve's present discharge system. The balance of the tailings will continue to flow as a heavy density current along the bottom and into the 600-to-900-foot deep trough.



View from southeast following construction of new tailings handling system. Delta area will be site of thickening clarifying equipment. Landscaping will stabilize surface, enhance appearance.

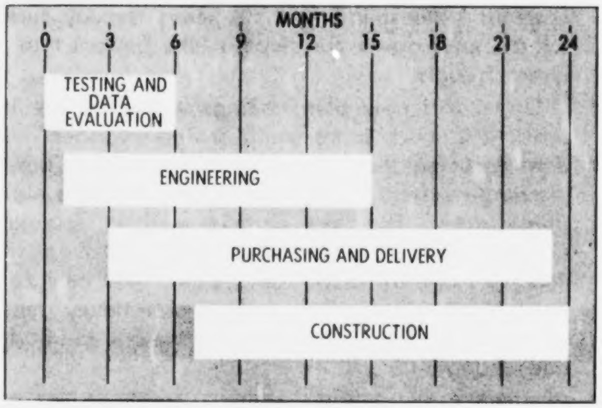


Solid barrier will secure present beach, and prevent beach tailings from being washed away by wave action.

ADVANTAGES OF NEW PLAN

There will be a vast improvement in the appearance of the present delta. Most of the beach now has a shifting, varying flow of water-borne fine tailings flowing across it which is somewhat unattractive. Under the new plan all of the delta will be landscaped with native trees, grasses and shrubs as quickly as construction is completed (see accompanying sketch).

Further, the new system will stabilize the existing delta and make it a permanently useful area. Tailings handling equipment and a number of small



Construction timetable. Preliminary engineering has been completed.

ESTIMATED CAPITAL COSTS
PARSONS-JURDEN CORP.
SUMMARY

Major Equipment	$ 2,210,000
Installation	620,000
Total, Major Equipment	$ 2,830,000
Other Materials	$ 1,415,000
Subcontracts	2,650,000
Labor	1,548,000
Total, Other Materials	$ 5,613,000
Other Construction Field Costs (Supervision, field engineering, temporary buildings, rental equipment, consumable supplies, warehousing, freight, etc.)	$ 1,650,000
Soil Mechanics and Equipment Tests	$ 110,000
Design engineering, procurement, construction support, etc.	700,000
Contingencies	2,547,000
Contractors' Fees	550,000
TOTAL	$14,000,000

buildings to be located on the delta will be enhanced in appearance by the tree and shrub plantings. The 14 eight-inch diameter pipes which carry the thick tailings-and-water mixture will enter the lake below the water's surface.

Today, the edge of the beach is subject to wave action which grinds the coarser tailings together creating very fine particles. Some of these fines, and others entrapped by coarse particles settling out, are sometimes washed out of the beach and carried away temporarily by surface currents. The new system calls for the exposed, outer edge of the delta to be protected from waves and currents by a stabilizing facing.

No hazard to navigation will result since the discharge pipes will enter the lake at a safe depth and their ends will be marked with anchoring buoys. Nor can the pipes accidentally rise to the surface in the event of a power failure or freeze-up because their special construction gives them a buoyancy rating slightly below that required for flotation. The 150-foot below-surface sand reef, of course, will be far below recommended limits for large loaded lake vessels which draw only 30 feet of water. Even when Reserve's mineral body is exhausted in about 40 years at current operating rates, the reef 150 feet below the surface will cover an area of only 1.2 square miles.

The proposed tailings discharge will be thickened by using the same kind of settling agents now widely used in municipal water treatment plants to clarify drinking water. The very fine tailings which do not settle fast enough to form the underwater reef will be carried more quickly and surely along the lakebed to very deep water by a heavy density current because the tailings have been flocculated and the suspended solids load will be greater.

No tailings should be carried away by surface currents because there should be no tailings in surface waters. The fines will be pumped down to the deep water to settle closer to the discharge point —well below any surface-affecting thermoclines or currents or wave action.

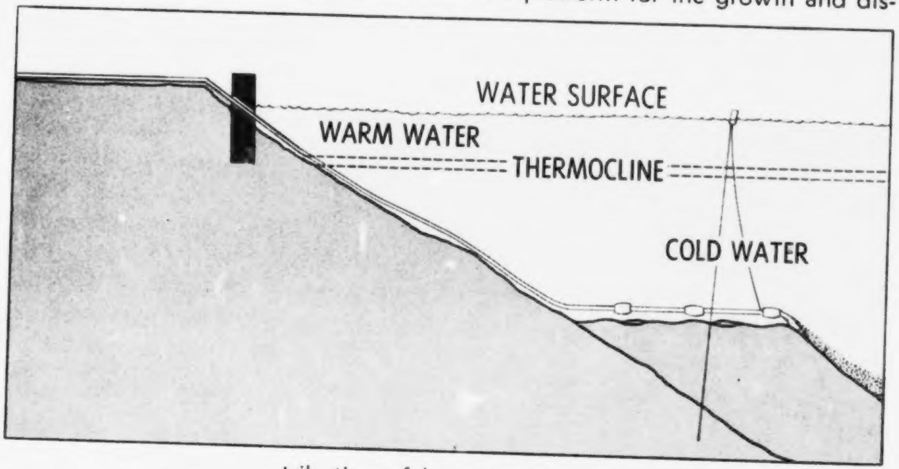
The State Permits describe a zone of discharge which defines the area in which the tailings enter the Lake. More than 90% of Reserve's total tailings will settle out on the bottom within the zone of discharge with the remainder settling in the nearby

f

Great Trough. The turbidity attributed to tailings at the perimeter of the zone of discharge at all depths will be within the most severe limits for the finest drinking water, 5 JTU, or less, as established by the State of Minnesota.

Thus, tailings should no longer be a cause of the "green water" phenomenon which occasionally and temporarily exists in the vicinity of Silver Bay. In other areas of the lake where natural sediments temporarily in suspension cause "green water", the phenomenon will continue. In such cases, however, tailings will not be present.

The new plan will eliminate the occasions when tailings from the discharge can be carried away from the zone of discharge by surface or near-surface currents. This, in turn, should eliminate the concern some people have that tailings in surface waters presently have the potential to: (a) contribute to the growth of algae; (b) furnish a platform for the growth and distribution of bacteria; (c) reduce sunlight penetration needed for the growth of periphyton; (d) increase the lake's turbidity; or, (e) spread tailings all along the North and South shores.

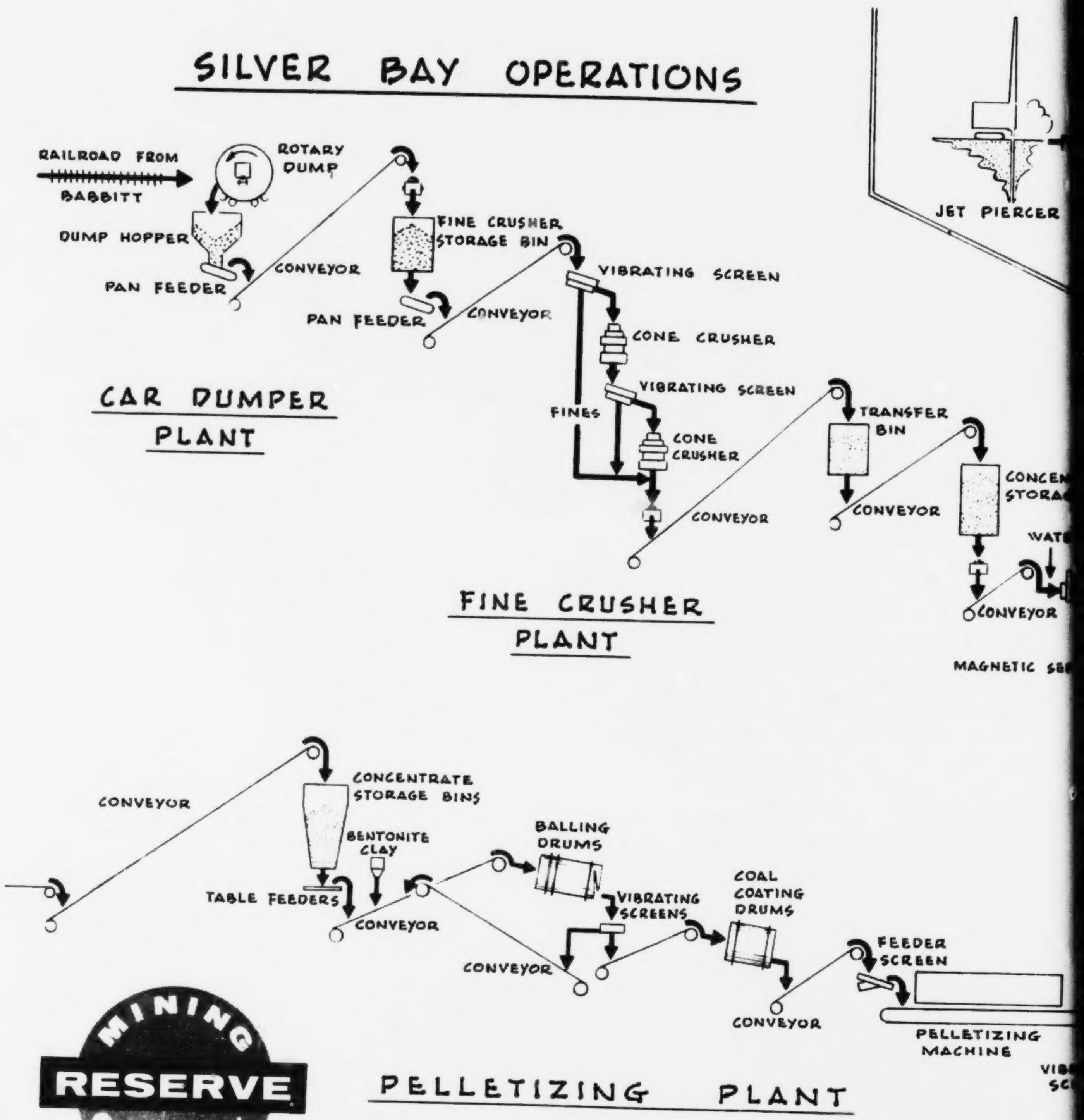


Pumping material to 150-foot depth will solve problem of thermocline behavior which at times can catch and hold particles in temporary suspension.

Bottom fauna populations in the vicinity of the discharge will increase since the reef created will be at a depth most agreeable to them—about 100 to 150 feet below the surface. Presently, the depth adjacent to the discharge is 300 to 500 feet and not conducive to the growth of fish food organisms.

The implementation of this plan to modify Reserve's tailings discharge is, of course, contingent on a resolution of the pending litigation, claims and scheduled hearings as well as necessary permit amendment and extension.

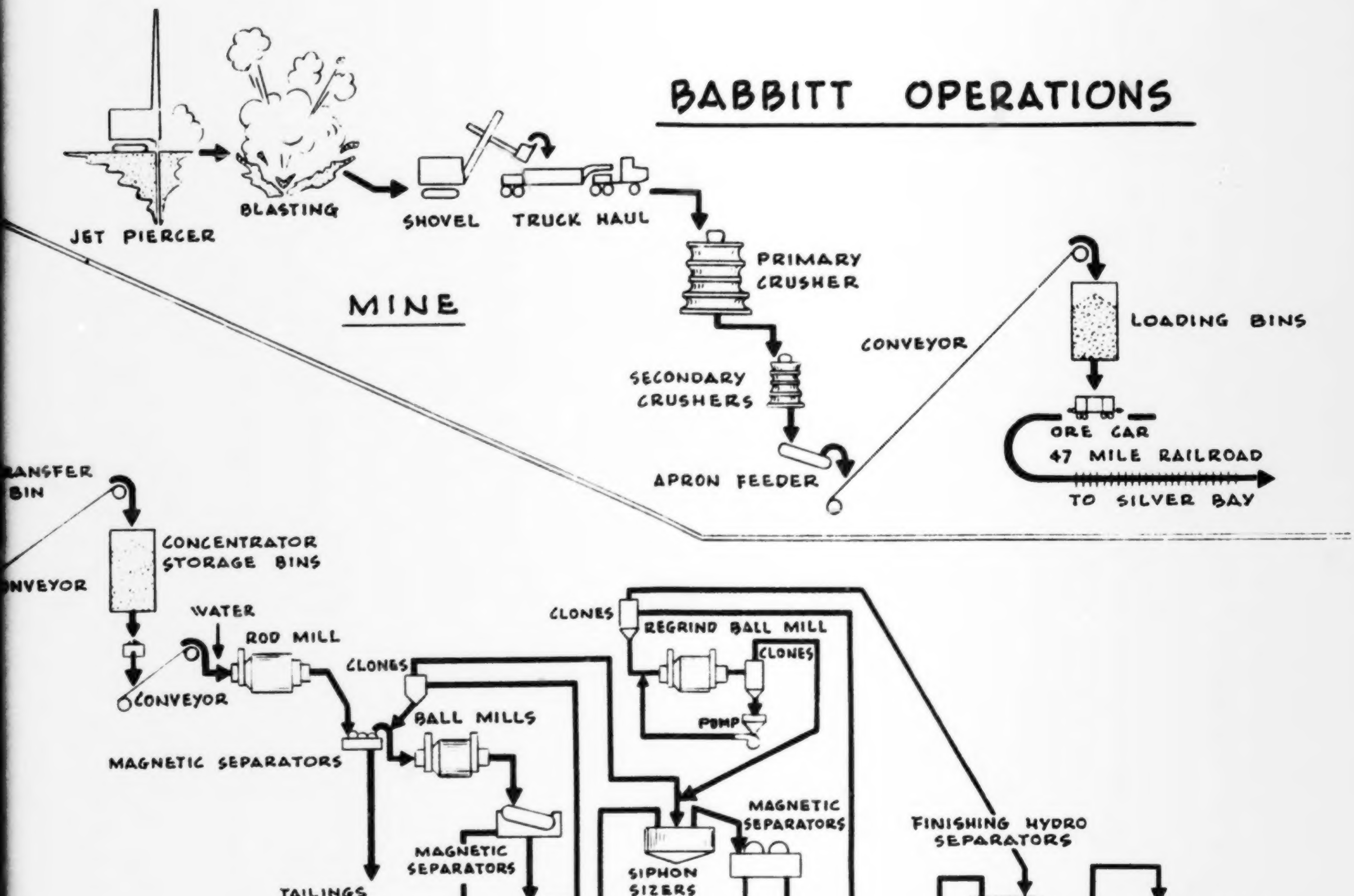
SILVER BAY OPERATIONS

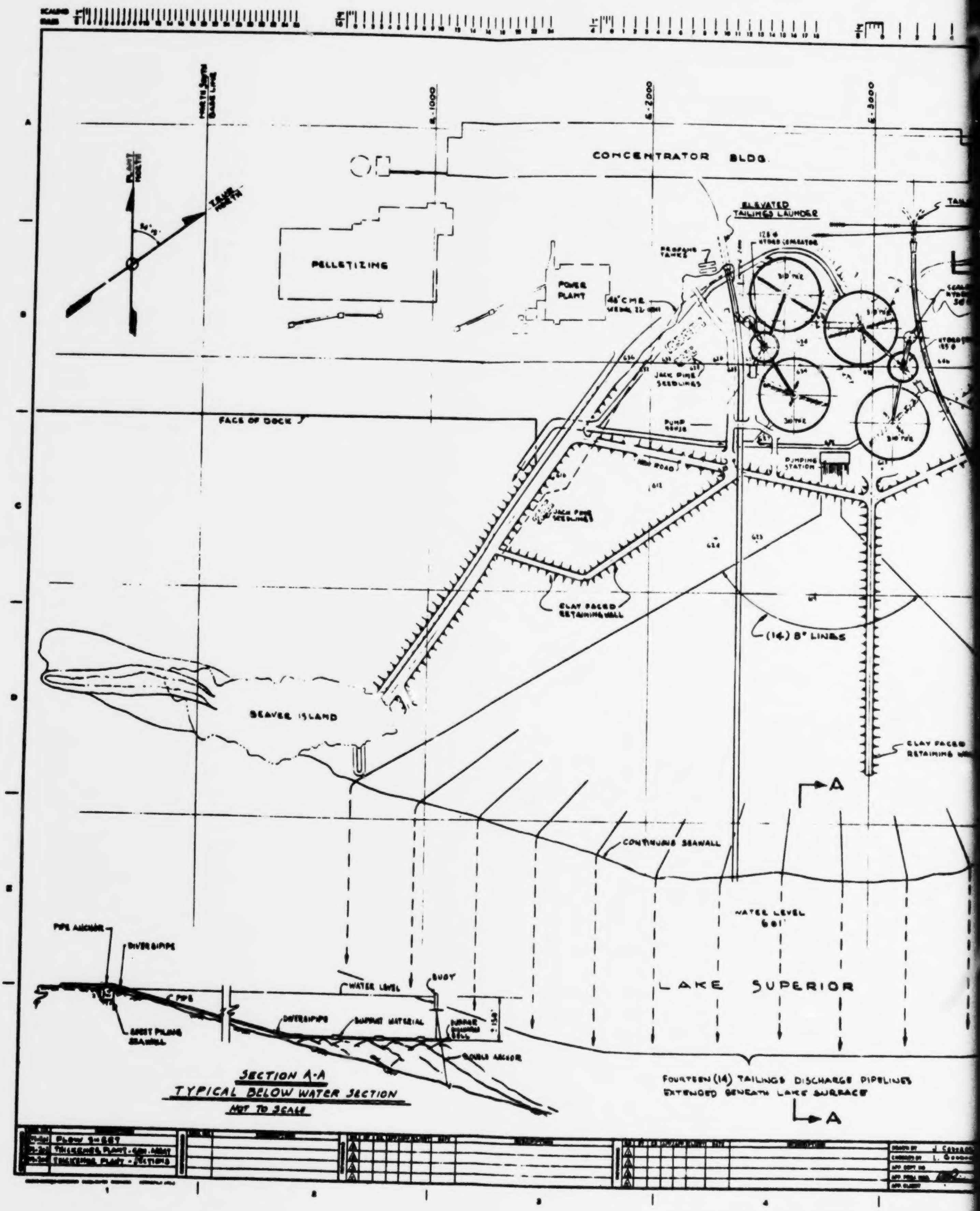

JET PIERCER
RAILROAD FROM BABBITT
ROTARY DUMP
DUMP HOPPER
PAN FEEDER
CONVEYOR
FINE CRUSHER STORAGE BIN
PAN FEEDER
CONVEYOR
VIBRATING SCREEN
CONE CRUSHER
VIBRATING SCREEN
FINES
CONE CRUSHER
CONVEYOR
TRANSFER BIN
CONVEYOR
CONCEN
STORA
WATE
CONVEYOR
MAGNETIC SE
CAR DUMPER PLANT
FINE CRUSHER PLANT
CONVEYOR
CONCENTRATE STORAGE BINS
BENTONITE CLAY
TABLE FEEDERS
CONVEYOR
BALLING DRUMS
VIBRATING SCREENS
CONVEYOR
COAL COATING DRUMS
CONVEYOR
FEEDER SCREEN
PELLETIZING MACHINE
VIB
SC
PELLETIZING PLANT

MINING
RESERVE
COMPANY

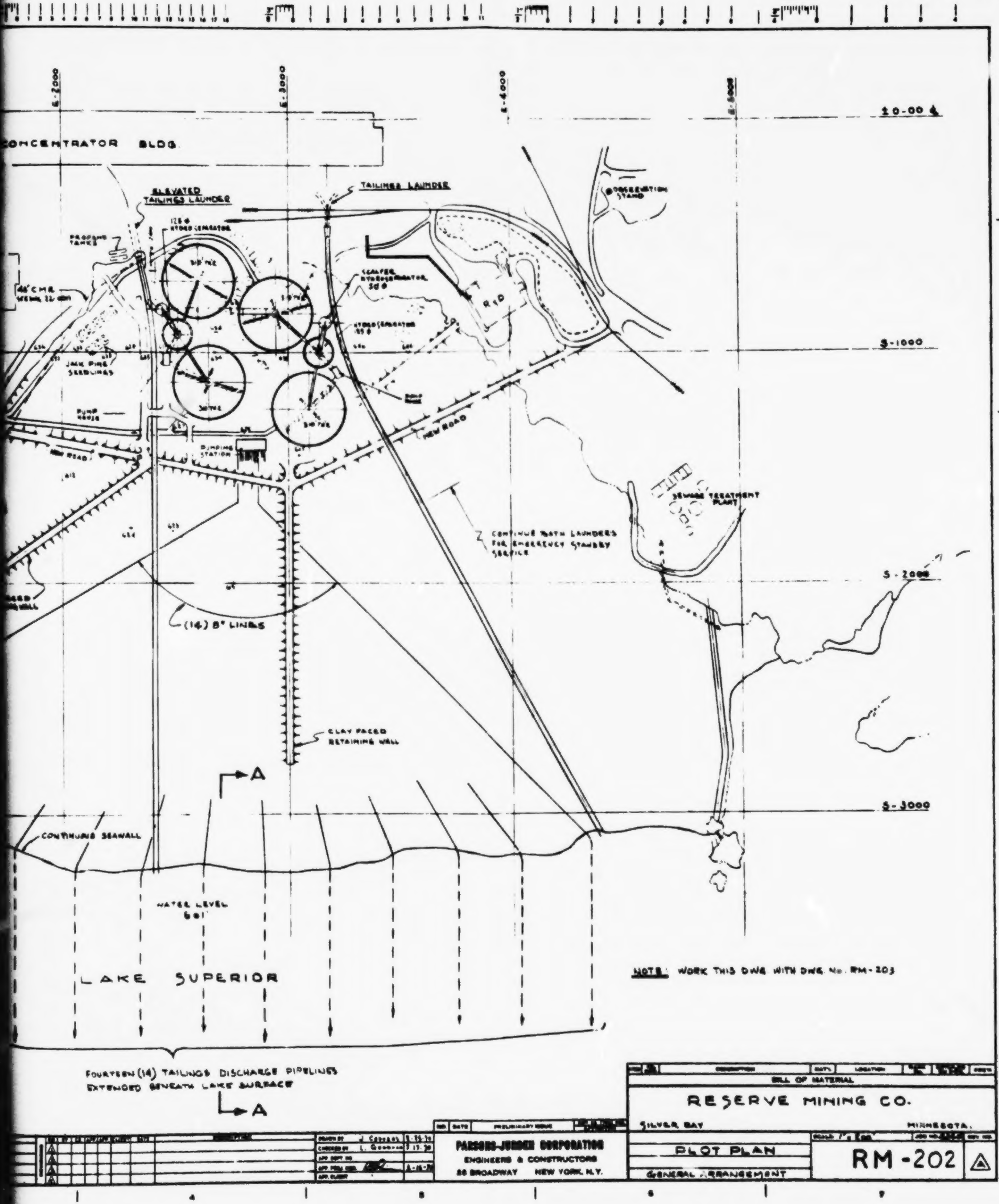
SCHEMATIC FLOW DIAGRAM

BABBITT OPERATIONS


JET PIERCER
BLASTING
SHOVEL
TRUCK HAUL
PRIMARY CRUSHER
MINE
SECONDARY CRUSHERS
APRON FEEDER
CONVEYOR
LOADING BINS
ORE CAR
47 MILE RAILROAD
TO SILVER BAY
RANSFER BIN
ONVEYOR
CONCENTRATOR STORAGE BINS
CONVEYOR
WATER
ROD MILL
CLONES
MAGNETIC SEPARATORS
BALL MILLS
TAILINGS
MAGNETIC SEPARATORS
TAILINGS
PUMPS
CLONES
REGRIND BALL MILL
CLONES
PUMP
SIPHON SIZERS
TAILINGS
MAGNETIC SEPARATORS
SUMP TANK
PUMP
TAILINGS
FINISHING HYDRO SEPARATORS
PUMPS
TAILINGS
FILTER
CONVEYOR
CONCENTRATOR PLANT
FEEDER SCREEN
PELLETIZING MACHINE
VIBRATING FEEDER
VIBRATING SCREEN
CONVEYOR
CONVEYOR
TRUCK HAUL
SHOVEL
PELLET STORAGE PILE
PELLET STORAGE BINS
BOAT LOADERS
ORE BOAT
PELLET STORAGE AREA
M



NORTH SOUTH BASE LINE
E-1000
E-2000
E-3000
PLANT NORTH
TRUE NORTH
CONCENTRATOR BLDG.
PELLETIZING
POWER PLANT
48" C.M.P.
ELEVATED TAILINGS LAUNDER
PROPANE TANKS
JACK PINE SEEDLINGS
PUMP HOUSE
PUMPING STATION
NEW ROAD
FACE OF DOCK
CLAY FACED RETAINING WALL
(14) 8" LINES
BEAVER ISLAND
CLAY FACED RETAINING WALL
A
CONTINUOUS SEAWALL
WATER LEVEL 601'
LAKE SUPERIOR
PIPE ANCHOR
DIVERSIPIPE
PIPE
SHEET PILING SEAWALL
WATER LEVEL
BUOY
DIVERSIPIPE
SUPPORT MATERIAL
DOUBLE ANCHOR
SECTION A-A
TYPICAL BELOW WATER SECTION
NOT TO SCALE
FOURTEEN (14) TAILINGS DISCHARGE PIPELINES EXTENDED BENEATH LAKE SURFACE
A
FLOW SHEET
THICKENING PLANT - GEN. ARRGT
THICKENING PLANT - SECTIONS
J. C
L. Good
1
2
3
4


E-2000
E-3000
E-4000
E-5000
S 0-00
S-1000
S-2000
S-3000
CONCENTRATOR BLDG.
ELEVATED TAILINGS LAUNDER
TAILINGS LAUNDER
PROPANE TANKS
125 Ø HYDROSEPARATOR
48" CMR
OBSERVATION STAND
SCALPER HYDROSEPARATOR 50 Ø
HYDROSEPARATOR 125 Ø
R.O.
JACK PINE SEEDLINGS
PUMP HOUSE
PUMPING STATION
NEW ROAD
NEW ROAD
SEWAGE TREATMENT PLANT
CONTINUE BOTH LAUNDERS FOR EMERGENCY STANDBY SERVICE
(14) 8" LINES
CLAY FACED RETAINING WALL
A
CONTINUOUS SEAWALL
WATER LEVEL 601'
LAKE SUPERIOR
NOTE: WORK THIS DWG WITH DWG No. RM-203
FOURTEEN (14) TAILINGS DISCHARGE PIPELINES EXTENDED BENEATH LAKE SURFACE
A
A
B
C
D
E
F
4
5
6
7

BILL OF MATERIAL

RESERVE MINING CO.

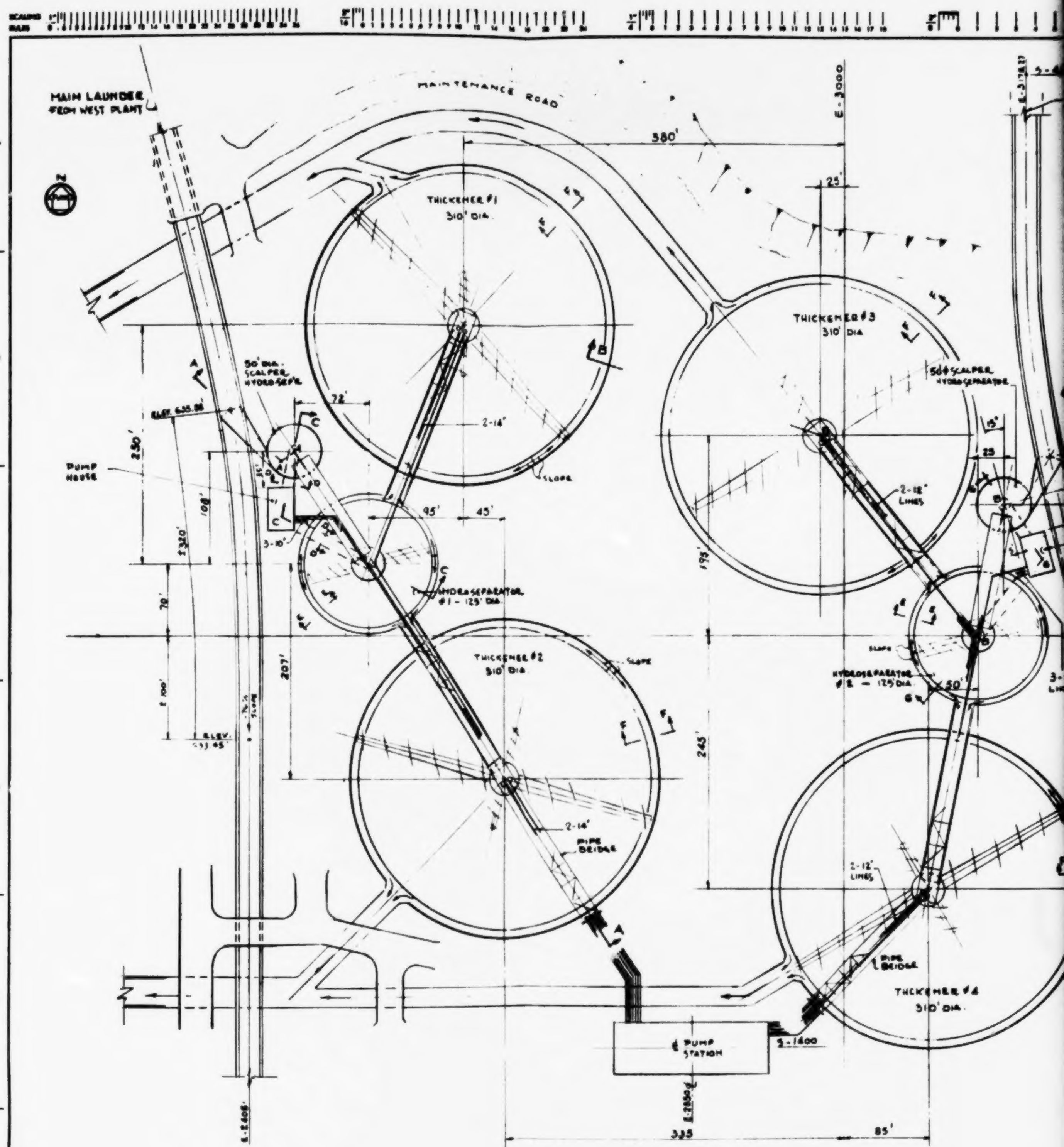
SILVER BAY
MINNESOTA.

PLOT PLAN

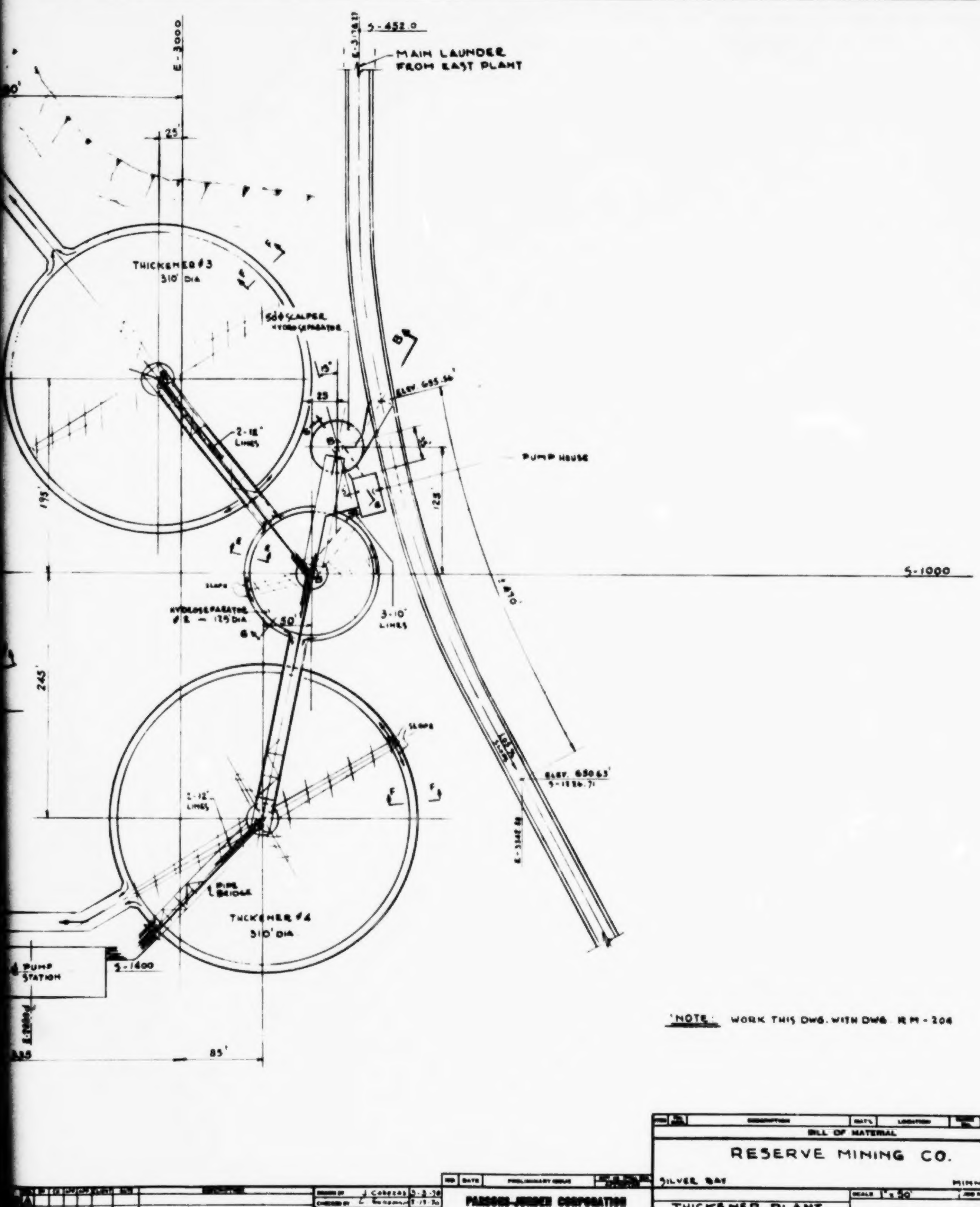
GENERAL ARRANGEMENT

RM-202

PARSONS-JURDEN CORPORATION
ENGINEERS & CONSTRUCTORS
25 BROADWAY NEW YORK, N.Y.


MAIN LAUNDER FROM WEST PLANT
MAINTENANCE ROAD
380'
E-3000
25'
THICKENER #1 310' DIA.
THICKENER #3 310' DIA.
50' DIA. SCALPER HYDROSEP'R
50' SCALPER HYDROSEPARATOR
ELEV. 635.98
72'
2-14"
PUMP HOUSE
230'
108'
320'
95'
45'
3-10"
HYDROSEPARATOR #1 - 125' DIA.
2-12" LINES
15'
25
HYDROSEPARATOR #2 - 125' DIA
50'
70'
100'
ELEV. 633.45
SLOPE
207'
THICKENER #2 310' DIA.
195'
245'
2-14"
PIPE BRIDGE
2-12" LINES
PIPE BRIDGE
THICKENER #4 310' DIA.
PUMP STATION
S-1600
E-2850
E-2605
335
85'
FLOW SHEET
PLOT PLANT
THICKENER PLANT - SECTIONS

284


E-3000
S-452.0
E-3178.27
MAIN LAUNDER FROM EAST PLANT
25'
THICKENER #3 310' DIA
50' SCALPER HYDROSEPARATOR
15'
25
ELEV. 655.56'
2-12" LINES
PUMP HOUSE
195'
125'
S-1000
HYDROSEPARATOR #8 - 125' DIA
50'
3-10" LINES
SLOPE
245'
SLOPE
2-12" LINES
ELEV. 650.63'
S-1286.71
E-3342.88
PIPE BRIDGE
THICKENER #4 310' DIA
PUMP STATION
S-1400
E-2800
85'

NOTE: WORK THIS DWG. WITH DWG. RM-204

BILL OF MATERIAL

RESERVE MINING CO.

SILVER BAY MINNESOTA

DRAWN BY J. Cabezas 3-3-70
CHECKED BY L. Goodman 3-13-70
APP. PROJ. ENG. R.W. Price 3-18-70

PRELIMINARY ISSUE

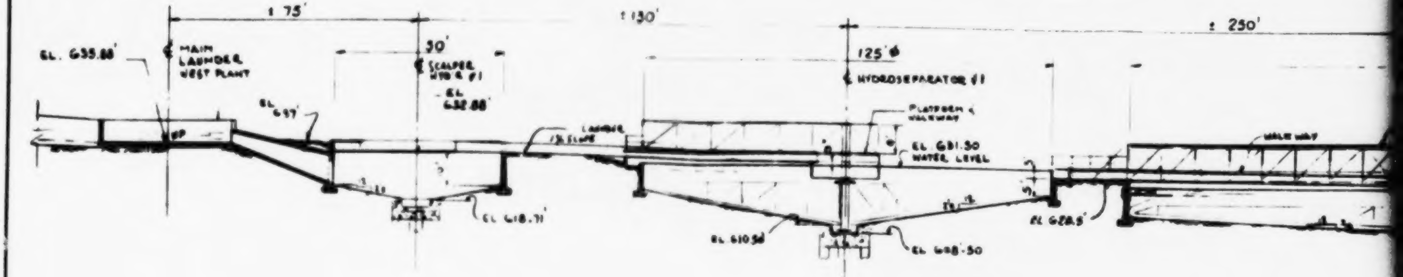
PARSONS-JURDEN CORPORATION
ENGINEERS & CONSTRUCTORS
25 BROADWAY NEW YORK, N.Y.

THICKENER PLANT

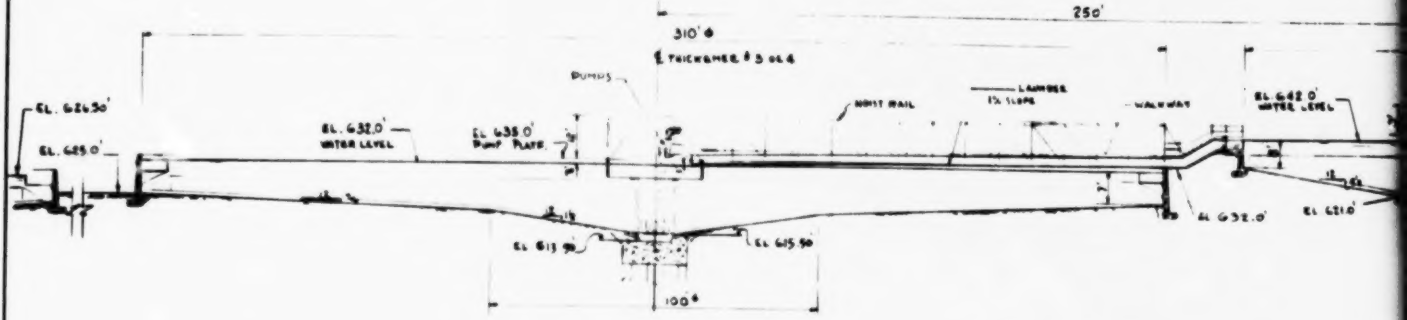
GEN. ARRGT.-PLAN

SCALE 1" = 50'

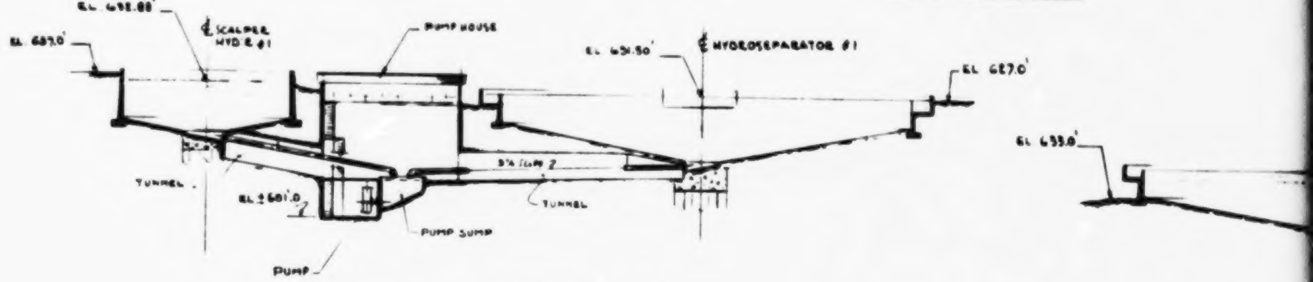
RM-203 △


SCALED BARS
± 75'
± 130'
± 250'
EL. 635.88'
℄ MAIN LAUNDER WEST PLANT
30'
℄ SCALPER HYD R #1
EL 632.88'
EL 637'
LAUNDER 1% SLOPE
125' Ø
℄ HYDROSEPARATOR #1
PLATFORM & WALKWAY
EL 631.50 WATER LEVEL
WALKWAY
EL 618.71'
EL 610.50
EL 608.50
EL 628.5'

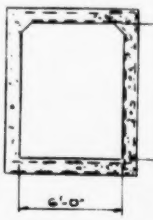
SECTION A-A


250'
310' Ø
℄ THICKENER # 3 OR 4
PUMPS
EL. 626.50'
EL. 625.0'
EL. 632.0' WATER LEVEL
EL. 635.0' PUMP PLATE
HOIST RAIL
LAUNDER 1% SLOPE
WALKWAY
EL. 642.0' WATER LEVEL
EL. 632.0'
EL 621.0'
EL 613.50
EL 615.50
100'

SECTION B-B

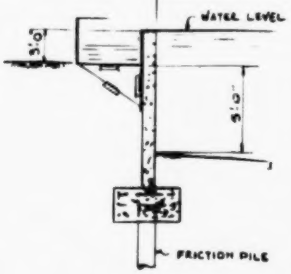

EL. 632.88'
℄ SCALPER HYD R #1
EL. 637.0'
PUMP HOUSE
EL. 651.50'
℄ HYDROSEPARATOR #1
EL. 627.0'
TUNNEL
EL ± 601.0
3% SLOPE
TUNNEL
PUMP SUMP
PUMP
EL. 633.0'

SECTION C-C



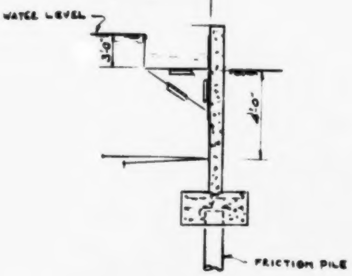
SECTION D-D

NO SCALE


125' DIA.
WATER LEVEL
3'-0"
5'-0"
FRICTION PILE

SECTION E-E

NO SCALE

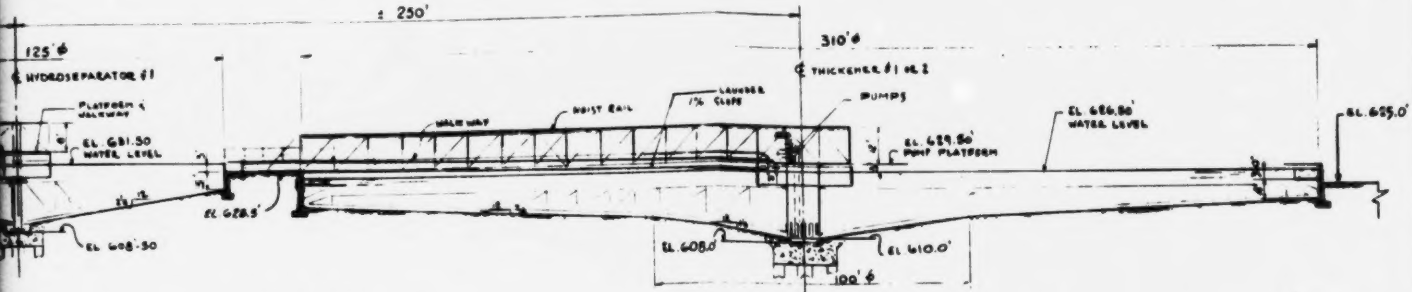

310' DIA
WATER LEVEL
3'-0"
4'-0"
FRICTION PILE

SECTION F-F

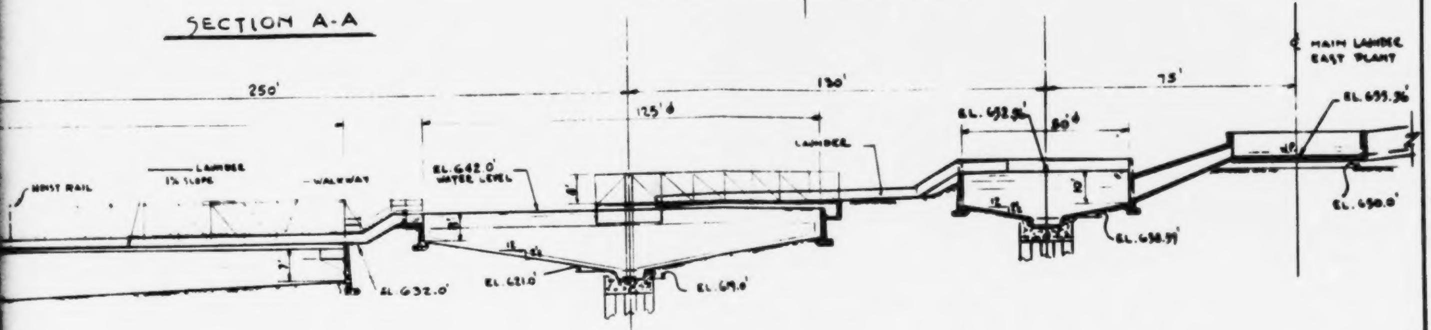
NO SCALE

DWG NO	DESCRIPTION
R4-201	FLOW SHEET
R4-202	PLOT PLAN
D4-203	THICKENER PLANT - GEN ARRGT.

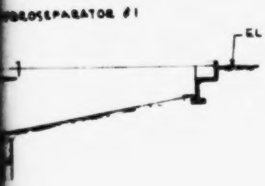
DRAWN BY J Cabagan
CHECKED BY L. Goodman
APP. DEPT HD
APP. PROJ. MGR.
APP. CLIENT

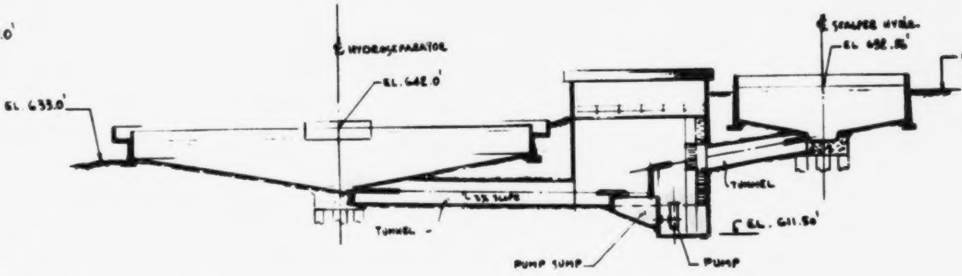

± 250'
125' ϕ
℄ HYDROSEPARATOR #1
PLATFORM & WALKWAY
EL. 681.50 WATER LEVEL
EL 628.5'
EL 608.50
WALKWAY
HOIST RAIL
LAUNDER 1% SLOPE
310' ϕ
℄ THICKENER #1 & 2
PUMPS
EL. 629.50' PUMP PLATFORM
EL. 626.50' WATER LEVEL
EL. 625.0'
EL. 608.0'
EL 610.0'
100' ϕ

SECTION A-A

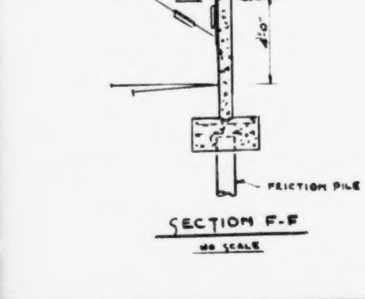

250'
130'
75'
125' ϕ
80' ϕ
℄ MAIN LAUNDER EAST PLANT
HOIST RAIL
LAUNDER 1% SLOPE
WALKWAY
EL. 642.0' WATER LEVEL
LAUNDER
EL. 652.50'
EL. 655.50'
EL. 650.0'
EL. 638.50'
EL. 632.0'
EL. 621.0'
EL. 619.0'

SECTION B-B


HYDROSEPARATOR #1
EL 627.0'


℄ HYDROSEPARATOR
EL. 642.0'
EL. 633.0'
℄ SCALPER HYDR.
EL. 652.50'
EL. 650'
TUNNEL
TUNNEL
EL. 611.50'
PUMP SUMP
PUMP

SECTION G-G


310' DIA
WATER LEVEL
3.0'
FRICTION PILE

SECTION F-F

NO SCALE

NOTE WORK THIS DWG. WITH DWG. RM-203

BILL OF MATERIAL

RESERVE MINING CO

SILVER BAY
MINNESOTA

THICKENER PLANT
SECTIONS

SCALE 1" = 20'

RM-204 △

DRAWN BY J. Cabagay 3-5-70
CHECKED BY L. Goodman 3-13-70

PARSONS-JURDEN CORPORATION
ENGINEERS & CONSTRUCTORS
25 BROADWAY NEW YORK, N.Y.

E. Fride

MR. FRIDE: I might say that, as you note in the engineering plan, it is in two basic parts. A blue divider separates the plan. The part subsequent to the blue divider is the actual engineering plan which has appended to it engineering drawings; while before the blue divider there is introductory material.

The plan includes artist's sketches and the various drawings which will be also shown as part of Mr. Skinker's presentation in the form of slides, so that the audience will be able to see them. But I do mention to the conferees that all of the slides that will be shown are already reproduced in the plan.

One note of caution. While this plan is specific, it, of course, is not detailed engineering as the conferees are well aware, and there are some questions which necessarily await resolution until detailed engineering will be completed.

Yesterday there was some comment from the podium and from the conferees about a Bureau of Mines report. The Bureau of Mines report was appended to the, I believe, April 1969 appraisal report of the Federal Water Quality Administration.

There was some inference yesterday by one of the speakers that the Bureau was recommending onland disposal in the course of the reports.

This is not accurate, and I think the record should reflect that what the report actually showed on this subject was, and I quote: "The second suggestion to deposit the tailings in a pond on the high ground above the plant, creates many problems. Objectionable effects of a tailings pond would have to be carefully weighed against the effects of depositing the tailings in Lake Superior. The area nearest Reserve is valued as a resort and recreation area; most of the area farther removed is in the Superior National Forest. A tailings pond could create a serious air pollution problem due to dust unless properly designed and operated..."

"The Bureau of Mines is not recommending this site for tailings disposal, nor can it make recommendations of this or any other site until the quantity and nature of the detrimental material, if any, that Reserve is contributing to Lake Superior is established..."

"When considering alternates to tailings deposition in Lake Superior, benefits gained should be compared to possible losses; i.e., would a tailings pond and a possible air pollution problem in a particular area be less objectionable than depositing tailings in Lake Superior?"

There was also the inference yesterday that the particular report to which I have just referred indicated that onland tailings deposition system could be constructed for the cost of $7.5 million. Again, the report really just does not say that. The only reference to $7.5 million in that report is that a preliminary small dike plan, which would be good for only 3 years production would require $7.5 million capital investment; that for the entire dam facilities, which would be necessary, the capital investment would be $70 million. And then they went on to be very careful to say that the cost estimates were prepared without the benefit of any field work; that they assumed that there would be no unusual dike or foundation conditions; the power for operating was available; made no provision for emergency discharge in the case of power failure; and a number of other items.

So I just wanted to have the record indicate that the suggestion that the Bureau of Mines either recommended onland tailings deposition or suggested that such facilities could be constructed for the amount mentioned is simply just inaccurate.

This conference last April was presented with various alternate proposals. Behind each of those alternate proposals were engineering studies which were also presented to the conferees. Reserve Mining Company has continued diligently working, examining and analyzing, in consultation with their engineering consultants, since the presentation was made last April. Obviously many of the facets of the various plans had to be carefully analyzed in terms of pilot plant work, in terms of perhaps the use of flocculents, in terms of the investigation of many of the aspects. Many refinements have been made in the plan which is now presented to you.

While many answers have been reached, there still remain, of course, some technical questions. If this conference and the appropriate regulatory agencies approve this plan, Reserve Mining Company would, of course, welcome participation by technically qualified people from the Federal and State level to work with Reserve to ensure that consideration of all proper ecological factors be made.

As Mr. Furness mentioned yesterday, and as the conferees are well aware, Reserve has retained outstanding consultants from an engineering and environmental standpoint. Parsons-Jurden organization is one of such consultants. That organization includes some 15,000 employees representing many different kinds of engineering specialties. They have major design offices located throughout the world. They have designed and constructed air and water pollution control facilities for private and governmental units throughout the Nation and throughout the world.

Specifically, in the field of tailings systems, their design and construction work includes plants in Chile, Arizona, Mexico, Montana, Ontario and others. They designed and constructed the system at Erie Mining Company at Hoyt Lakes, Minnesota. There are a number of other facts of the background of this organization which time does not permit, Mr. Chairman, me to go into.

I would, however, like to make a part of the record this booklet which does speak to their qualifications in the tailings dispositional area.

MR. STEIN: We will accept that as an exhibit.* Thank you.

Charles R. Skinker, Jr. is Vice-President and Manager of Metallurgical Production Division of the Parsons-Jurden organization. He is a Yale engineering graduate, and for some 34 years has had experience in this field.

At this time, with pleasure I call on Mr. Skinker.

*(This document may be reviewed at the Regional Office of EPA or the Washington, D.C. Office.)

STATEMENT OF CHARLES R. SKINKER, VICE PRESIDENT, PARSON-JURDEN CORPORATION, NEW YORK CITY, NEW YORK

MR. SKINKER: Mr. Chairman, distinguished conferees, ladies and gentlemen.

Parsons-Jurden Corporation was commissioned by Reserve Mining Company in 1969 to study the present tailings disposal system at their plant in Silver Bay, Minnesota, and to recommend an alternate method of disposing of this tailings material.

This plan for disposal of the Reserve tailings has endeavored to weigh thoroughly the following major governing considerations and their combined effects on the entire matter:

1. Ecological
2. Practical
3. Technical
4. Economic

In so doing, at least 19 other methods and plans have been considered and evaluated, all of which the conferees were made aware of in April 1970.

The Reserve Mining Company is currently

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processing approximately 95,000 tons of taconite ore per day; 65,000 tons of material are discharged as tailings which is essentially silica or common sand. The present ore dressing process utilizes tremendous quantities of water within the plant. Additional quantities of water are added to the tailings to effect its transport through launders for ultimate disposal in the lake.

To dispose of these tailings by any other method, it seems essential that the volume of water in the tailings slurry first be drastically decreased. Thickening the tailings slurry is the obvious answer. Ordinary thickeners cannot handle some of the materials as coarse as that which is presently being discharged. It is therefore necessary to classify or separate and thicken the material in steps. Since the Reserve Mining Company concentrator consists of two plants operating side by side, it has been recommended that the thickening plant be built in two companion sections, each serving one of the concentrator plants.

Normally, standard commercial equipment is not called upon to handle such large quantities of coarse material as are produced at Silver Bay. However, our studies and investigations with manufacturers indicate that a specially designed 50-foot diameter tangentially fed scalping hydroseparator will remove the plus 14 mesh (.046 inches, 1190 microns) material satisfactorily. This would be followed by a 125-foot diameter conventional hydroseparator to remove the minus 14 mesh plus 150 mesh (.0041 inches, 105 microns) material.

I hope you can see the slides over there because this will indicate to you the schematic -- this is kind of an artist's conception or schematic arrangement of how this material is handled. Can you see that?

The overflow from this second hydroseparator can then be thickened in two 310-foot conventional thickeners. Those are the large ones.

Four products would then be separated as follows:

1. An essentially plus 14 mesh underflow from the scalping hydroseparator. That is a cut-away section to give you an idea of the operating principle of a hydroseparator. A scalping hydroseparator is one that takes off the coarsest fraction of the underflow first.

2. A minus 14 mesh plus 150 mesh underflow from the main hydroseparator.

3. The remainder of the material as thickener underflow of minus 150 mesh.

4. Thickener overflow, clarified for return to the harbor area where it will mix with fresh water as it is

drawn into the pumping plant intake.

The products of 1, 2, and 3 above together with required sluicing water will be pumped as a slurry to a collecting sump in the main tailings pumping station. This thickened tailings slurry will next be pumped through pipelines fanning out across the existing delta and then down the slope of the lake bottom to a point approximately 140 feet beneath the surface. From there the pipelines will extend further horizontally into the lake to their discharge points while the lake bottom continues its downward slope.

By removing these solid products in an approximately 40 percent solids slurry, the volume of the slurry or pulp to be disposed of will be reduced from 302,000 g.p.m. to 22,100 g.p.m.

Based upon pilot plant tests, the thickener sizes in this system have been determined to achieve effective settling of the fine material with the use of flocculents or coagulants. It is expected that further engineering refinements will be undertaken prior to the final design of the thickening plant in order to determine the optimum equipment sizes.

The scalper hydroseparator, main hydroseparator, and thickener underflows are combined at the main tailings

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pumping station sump. This sump feeds 14 discharge pump line assemblies. The pump line assemblies each consist initially of one variable speed and one constant speed pump, with provisions for adding in the future the required additional pumps as the length of the discharge lines increase.

In order to provide for continuous operation within the wide range of flows to be expected in an operation of this nature, we have provided both variable and constant speed pumps, fully automated together with a complete system of operating indicators and alarms for all equipment together with provision for central control to coordinate this system with that of the operation of the concentrator.

In addition, we have provided a complete standby system for each hydroseparator and thickener, underflow pumping installation to assure continuity of operation and availability for maintenance.

The 14 discharge lines -- 13 of which are operating and one standby -- will run along the delta to the lake, fanning out to create a maximum area for distribution of the tailings. The lines will run through retaining structures and slope downward, following the underwater beach line and resting on the underwater beach

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surface. The lines will be run this way until they reach the design depth of 140 feet below the lake surface. The lines will then level off to their discharge position. From this position the thickened tailings slurry will be discharged, forming a heavy density current. A suitable assembly will be provided at the discharge to direct the stream and to minimize turbulence.

No hazard to navigation will result from this system since the discharge pipes enter the lake at a safe depth, are anchored to the lake bottom, and their ends will be marked with buoys.

This system utilizes the heavy density current for the continuous transport of the finer fraction of the tailings from the discharge of each pipeline toward the Great Trough.

The effectiveness of the heavy density current phenomenon is proportional to the relative densities of the flowing stream to that of the receiving body. In this instance, our proposed method will produce a far stronger current than in the existing system.

The proposed system will offer the added benefit of stabilizing the present delta area.

Lastly, operation and regulation of the proposed system will be satisfactorily maintained due to the type of equipment and safeguards employed and the physical method and location of deposition of the tailings underflow and clarified overflow.

The installed cost of the project is estimated to be approximately $14 million. As you see on the slide, it is detailed here for you so that you can see how this cost is reached. After receipt of required approval, the project could be constructed in 2 years, as is shown in the slide by the bar chart. Over a 20-year period, operation and maintenance costs are estimated to be $22,460,000. With interest and amortization, the total 20-year cost will amount to $48,960,000, as shown in the slide.

We have examined other approaches but, based on our best engineering judgment, this is the method most suitable for the satisfactory resolution of the problem from ecological, practical, technical, and economical feasibility standpoint.

As shown here -- a panoramic view of the proposed installation, once completed. In this panoramic view, you can see that the delta has been landscaped, and has been made to look very pleasing to the eye so that you don't have any esthetic impact on the landscape that is harmful in any way.

Thank you very much.

MR. FRIDE: Mr. Chairman, if I could just inject one thought here, and I would just ask, however, how the conferees would best like to proceed. Mr. Skinker, of course, is available for questions right now.

Also, if you prefer to hear Dr. Weinberger discuss some of the ecological kinds of concerns involved in the plan, then they would both be available for questioning. So, however, the conferees wish to proceed —

MR. STEIN: Well, I was going to ask the same question myself. It might be best to get the whole picture first.

MR. FRIDE: Very well.

MR. STEIN: Is that agreeable?

Why don't you proceed with Dr. Weinberger, and if Mr. Skinker can remain available —

MR. SKINKER: I will be here.

MR. STEIN: Thank you.

MR. FRIDE: The second presentation that completes the plan is to be presented by Dr. Leon Weinberger. I know he needs no introduction to most of the conferees. He is a man who has devoted a lifetime to scientific engineering and environmental concerns. He is a former Assistant Commissioner for Research and Development with the Federal Water Pollution Control Agency. He is presently an independent consultant. Dr. Weinberger has been very close to Reserve Mining Company since the beginning of the consideration of possible modifications of the tailings discharge system. We have relied on his advice and judgment in many areas, and he has been the one who has been analyzing it from an impact to environment -- the kinds of concerns that all of us have today on today's ecology.

Dr. Weinberger.

MR. STEIN: Very well. When Dr. Weinberger comes up let me go off the record for a moment.

(Discussion off the record.)

MR. STEIN: Dr. Weinberger.

STATEMENT OF DR. LEON W. WEINBERGER, CONSULTING ENGINEER, POTOMAC, MARYLAND

DR. WEINBERGER: Mr. Chairman, conferees, ladies and gentlemen.

I am Dr. Leon W. Weinberger, a sanitary engineer with 25 years' experience and training in the scientific and technical aspects of water pollution control and water quality management. This experience has included research and development, engineering, management, and as an educator. As former Assistant Commissioner - Research and

Development, Federal Water Pollution Control Administration, U. S. Department of the Interior, I had occasion to work with many of you in an effort to maintain and enhance the quality of our environment.

I have been retained by Reserve Mining Company to review all of the scientific and technical information which has been developed and presented by all participants at the various sessions of this enforcement conference as well as all of the engineering studies carried out by Reserve Mining personnel and consultants.

As you would expect, I advised Reserve Mining Company, at the start, that I would make an objective evaluation of all of the information and not simply to attempt to discredit scientific and technical findings which were critical of Reserve. My analyses, conclusions, and recommendations were to be made on the basis of what was necessary to protect and preserve the quality of Lake Superior and not necessarily to come up with a zero or minimum cost solution. Reserve indicated that not only would they accept my conditions but that they were seeking precisely that type of advice. My role was to place particular emphasis on the environmental impact of past, current, and future discharges from the operations at Silver Bay. All of my questions and comments were given serious consideration and resolution made to my satisfaction.

Reserve has carried out many engineering studies and designs on alternative means for modifying their discharge into the lake. These have been presented to the conferees in the past. I would add that Reserve has been willing to investigate the applicability of any idea or concept. As a result of a careful analysis of all alternatives, a plan to modify the tailings discharge was developed. The preliminary engineering design has been presented to the conferees. This modification should result in a very significant reduction in those water quality parameters attributable to Reserve about which objections have been raised.

I do not intend to here review the scientific opinions and findings presented by Reserve, government, and other witnesses. In spite of what has appeared to be divergent scientific views, the various participants are, in fact, very close to scientific and technical agreement.

It has been recognized that most of the solids, the tailings, being discharged by Reserve would descend quite rapidly to the depths of the lake and cause no problems. The deposition of solids on the bottom of the deep portions of the lake need not be of any concern in terms of changing the quality of the water or any of the uses of the lake. However, because of the large volumes of water recirculated, the amount of the material being discharged, and the natural dynamic lake forces, a small amount of the solids occasionally appears at the surface of the lake near the shore under existing discharge conditions.

There has been no measurable adverse effect on water quality for domestic consumption, fisheries, and recreation, industrial consumption, agricultural and wildlife or any other known use. A slight decrease in a fish food, Pontoporeia, in the vicinity of the discharge has been attributed to the tailings but the effects are minimal or of no significance on the fish population. The appearance of the lake at the site of the current Reserve discharge is objectionable to some. The only water quality change beyond the immediate vicinity of the Reserve discharge which may be attributed to the discharge of tailings is that the tailings may add to the "green water" phenomenon.

Although extremely small quantities of tailings have been found on the bottom of the lake at considerable distances from the discharge point, they have no measurable effect on water quality including aquatic life.

The effects on Lake Superior have been summarized by Dr. Donald I. Mount, Director, National Water Quality Laboratory, Duluth, Minnesota, at the Lake Superior

Conference April 29 and 30, 1970. He pointed out that:

1. "Green water" occurs without tailings being present. Tailings are indeed found in "green water" near discharge point. It is not the finding that the presence of tailings has an adverse effect on water supplies.

2. Tailings are being deposited primarily in the deep trough of the Minnesota shore.

3. Bioassay data clearly suggest that direct adverse effects of the tailings on fishes and fish food organisms will not occur at the concentrations expected in the lake.

4. There may be a slight growth promotion effect of the effluent but the data do not suggest there will be an algal bloom near point of discharge.

Dr. Mount stated, "In my judgment the effect of Reserve's discharge should be assessed in terms of altering the lake's appearance rather than the toxic effects on fish and fish food organisms, or endangering water supplies."

I have been very impressed with that statement of Dr. Mount, and I am generally in agreement with his conclusions and opinions.

In short, one would say that the major concern with regard to the tailings discharge from Reserve relates to the appearance — the esthetic considerations — and the limited migration of fine materials which are present in the Reserve discharge. The physical filling or deposition of solids is not a significant factor and indeed the rapid settling and deposition of the fine materials in the depths of the lake would be preferable to the current method of discharge, and, in my opinion, based on all information currently available is the best alternative of any which has been proposed.

The proposed plan to modify the tailings discharge system will overcome the esthetic objections and greatly reduce the migration of the fine particles. The design provides for the agglomeration and settling of fine particles in treatment facilities with the subsequent discharge of the solids removed through a closed conduit to a considerable depth below the surface of the water. As a result of the treatment provided an even more effective density current will be created which will accelerate the deposition of solids to the deep portions of the lake where they will have no adverse effects on the water quality or appearance of the lake. The delta type of discharge will be eliminated, and the delta area will be stabilized, landscaped and its appearance enhanced. The fines entering at the surface of the lake will be eliminated, thereby minimizing the migration of the solids and contribution that these fines would make to the green water phenomenon.

There is no question but that the plan proposed by Reserve will result in a significant improvement in the appearance of the lake around their point of discharge. In addition, since most of the apprehension concerning potential harmful effects relate to the migration of the fine materials, and their presence at or near the surface, by removing and depositing the fines, added steps are being taken to protect the high quality of Lake Superior.

Reserve has asked me and I have agreed to continue to review their program at Silver Bay and to work with all other groups who are interested in preserving and protecting the quality of the lake.

I thank you.

MR. STEIN: Does that conclude Reserve's presentation, Mr. Fride?

MR. FRIDE: Perhaps, Mr. Chairman, if it meets with your approval and to the extent that this seems appropriate, I can ask Mr. Skinker to come up, and Dr. Weinberger can be on the podium so you can ask them questions.

MR. STEIN: Thank you.

Are there any questions? Let me start it. I will break the ice and get this going.

I think this relates -- perhaps it should be directed to Dr. Weinberger. You largely related your comments to moderate damage to fish food, esthetic problems, etc.

But the conferees did find at the last session of the conference that Reserve, as well as other industries in the lake, were contributing to interstate pollution. The recommendation was approved and sent forward by Mr. Ruckelshaus, the Environmental Protection Administrator.

As I recall the testimony -- and I think the record of the last conference would bring this out -- Dr. Mount presented information indicating that nutrients were present in the tailings which got into the lake and were contributing to the accelerated eutrophication. 1) This is not mentioned in your paper; 2)if it is mentioned, if this is the case, and you may want to get into colloquy with Dr. Mount on this -- will the plan or will your plan that you have presented here by containing the tailings alleviate that condition?

DR. WEINBERGER: Mr. Stein, there are a couple of facets of your question. I would be happy to comment on all of them, of course.

One aspect of the interstate pollution which you refer to I think had to do with the presence of the fines, and, of course, I would not contest the fact that those fines indeed were migrating and ending up in the waters of other States and in interstate waters.

The proposed solution deals with that in terms of getting the fine material -- indeed all of the material -- down to a considerated depth below the surface, which would result in -- more or less interfered with settlings -- the solids would reach the bottom of the lake closer to the discharge point. Too, they would be free from some of the surface currents which would be involved. Because of the density current they would tend to go to the bottom more rapidly.

The question concerning the eutrophication, which has been presented, relates to the studies -- the laboratory studies that were made—which indicate that the materials found in the tailings or indeed almost any material could have nutrient value to the growth of algae.

My understanding of the findings was that this was a measurable -- based on the work the laboratory did -- was something that was measurable but was not something that was of concern in terms of creating excessive or significant contribution to the algal problem.

If you are asking a question whether this particular solution results in a reduction of dissolved material going into the lake, the answer to that is yes, in view of the fact that there is an effort to recirculate the amounts of water so that these would be recirculated within the plant and thereby reduce, if you will, any dissolved material going in.

I don't know whether this is responsive --

MR. STEIN: Well, this is responsive As far as I can see, this may be a key point and I would like Dr. Mount, if he can, when he thinks it is appropriate, to comment on this, because I believe one of the key elements you talked about in addition to the usual nutrients -- the phosphates and nitrates -- was manganese. They talked about that last time.

Now, if this in fact is reduced significantly in solution, and this is prevented to get in the lake in your plan, I think we have one set of factors. If it is not, I think we have to look at it in a different way, and I don't know what Dr. Mount and some of the other people may think of that aspect.

DR. WEINBERGER: Before Dr. Mount -- there were some other points which were raised, Mr. Stein And as I indicated in my prior testimony, I did not intend to be selective in terms of my review or comment.

Since you have raised that question, there was another point which was raised in the earlier studies which I would be real happy to respond to.

This was the question that was raised concerning the fact that bacteria would be more apt to survive longer in the tailings than if the tailings were not there.

Putting this thing again in a scientific context, I don't think there is any question but if you did have bacteria and they did have the protection of the surface of any particulate matter, there is no question but there would be an attempt for these organisms to live longer than they would without the particles. I cannot deny this.

I think it is important, of course, to indicate that the discharge from Reserve does not contain any pathogenic or disease-producing organisms, and furthermore any tendency for the bacteria to survive longer would be associated with those fine particles, and this program does provide for the fine particles to get to the bottom of the lake as rapidly as possible. I am aware of these things.

MR. STEIN: I would like to get to more detailed questions and let the scientific staff do this.

DR. WEINBERGER: I am sorry.

MR. STEIN: No. But stay there, Dr. Weinberger, because they didn't start it. One of the key questions that I think we have to relate ourselves to is to the findings that the conferees made at the last session of interstate pollution and whether this meets it.

Now, I think another key question that we should explore here -- and I hope you will have a colloquy with the scientific staff on that, and I am not sure I heard a direct answer from you on this yet in your paper -- whether this plan of Reserve will provide adequate protection of Lake Superior from an ecological standpoint, or whether it will contribute to the lake. And we haven't heard, except in a broad reference, how this solution would compare to other alternatives to protect the lake.

In other words -- and let me turn the coin around to what I said yesterday -- while I make no judgment before we hear all of the factors for water disposal or use disposal or land disposal that we heard of yesterday, I have no bias in favor of each. I think if you are going in terms of water disposal, we should have some kind of indication of why you don't think land disposal is satisfactory. Because, again, I think perhaps -- let me put it to you this way: On the proper conditions, as far as we are concerned in water pollution control, land disposal would be a satisfactory method of handling the waste, wouldn't it?

DR. WEINBERGER: Yes.

Again, let me lead into that, and -- I suspect the first question that I asked of Reserve Mining, when they asked me to review their plans, was what I think is obvious to not only the conferees but the people in the audience: Well, why not keep the tailings out of the lake? Why not come up with a land disposal system? (Applause)

And I don't think -- and, again, this was an obvious question, and from an absolute sense, if one can come up with an alternative that provided for that which would not create problems which were greater than those which were being contributed or could be contributed, why not go that way?

A number of alternatives were studied, and I would say that, based on what I have seen, any number of combinations considering as to how you would actually go about putting all of the tailings on the land -- these were presented to the conferees with all of these alternatives. And just very briefly the alternatives cover situations of everything ranging from taking everything out of the lake to taking the fines out of the lake, the coarse out of the lake, and all combinations.

Now, on the basis of the studies which were made and the analyses carried out -- again, I think, Mr. Stein and others here, I would like for them to comment in terms of some of the problems associated with the land disposal.

I wanted to make it very clear that this, of course, was the first alternative that I suggested that they look at. They had already started this, and these were presented.

Now, I think the question, Mr. Stein, very properly so, is: What are the many reasons for not going to a land disposal system?

Mr. Skinker has looked at this thing from the point of his own experience in terms of land disposal. I think he might want to comment on some of the problems here and I will remain here, of course.

MR. STEIN: Right.

MR. SKINKER: Mr. Chairman, land disposal immediately is a question of the local problem. It is never the same for any two, the way the tailings disposal situation is. In every instance that I know about with respect to land disposal, you create additional ecological problems in the area where the disposition of the material is. You create esthetic problems; you create practicable operating problems in areas like Minnesota where you have severe winter conditions, as an example, which are not always foolproof. And by so becoming dependent on land disposal, and yet not being able to make it 100 percent foolproof, situations could arise -- emergency type situations could arise -- and actually continuing situations would exist where the potential pollution to a larger area of watersheds and ultimately to the lake itself would be the product. And this is why we have taken the position, after looking at these various methods, that if you can suppress this material, agglomerate the fines to a large extent, and introduce it into the lake at a depth so that it is not subject to any surface disturbance of any kind by wave action, winds, or otherwise, that this is going to be in the long run -- in fact, right from the start -- a preferable method.

MR. STEIN: Mr. Skinker, again, the only reason I started the questions is because I wanted to give the technical people a chance to get their thoughts in order before they really went into detail.

But, in listening to your reply, I know this is a general reply. As far as I can see, though, you can say that to any water system. Any water disposal system, however good it is, disturbs the ecology as far as I know. I have said this many times at other meetings— that if you want to know where the biggest source of water pollution is in the country and where it is coming from, look at the outfall lines from the waste treatment plant, both industrial and municipal. This is where the wastes are coming from.

I know by sad experience, as this panel knows, that we don't have foolproof systems in water disposal either, and one of the big problems we have is they just don't run 24 hours a day 365 days a year under optimum conditions.

I think the question that we would like to have answered is why, in this specific case, did you consider -- if you did consider -- the risk to be greater to the ecology in land disposal than in the plan you have come up with? Can you address yourself to that?

MR. SKINKER: Well, first of all, if you use on-land disposal, you have to have some form of impounding structures. These impounding structures by their very nature create problems and can be potential hazards. Further, any kind of an impounding structure plus the tailings themselves are going to be subject to erosion, and these are two very important reasons why we do not recommend onland, onshore disposal.

Now, in addition to that, once you do create an onland disposal system of solids, of which a portion are quite fine, you have definite problems with dusting, wind-borne particles, and I have seen a number of -- a great many tailings disposal areas, and some of these, if you drive by them in a windstorm, would take the paint right off your car. Now, this is a pretty severe condition, but it can happen.

MR. STEIN: Do any of you have any questions?

MR. MAYO: Mr. Chairman, the Reserve proposal invites a substantial amount of inquiry. We would like to go at it at least in some measure of orderliness so that we don't find ourselves leaving bits and pieces out of our inquiry.

D. Mount

We thought we might begin by pursuing three principal subject matter areas: 1) the soluble materials and the nutrients issue; 2) fines or suspended sediment; and, 3) some of the questions related to physical fillings, and then proceed from there in terms of other principal issues.

I think we want to start with those three areas of inquiry, and invite the other conferees to interject their comments as we go along.

At this point, I will ask Dr. Mount to lead off for us in terms of the pursuit of these three principal areas of concern.

DR. MOUNT: I would prefer to begin with the soluble considerations, and I would like to clarify, again, what I attempted to clarify in the August session of the conference which related to my comments, I believe, from the April session about the concern being one of the appearance of the lake. And in August I said, again, that by that statement, by saying the concern was with regard to the appearance of the lake, that you included not only the problem of "green water," which we are convinced is caused by suspended material, particulate matter, but also I referred to the general aging of the lake, and for those who know Lake Erie and have seen it, they will know that a great part of the problem there is one of appearance of the lake.

If you have a cabin on a lake in Minnesota that has had organic matter going into it, many of you have commented to me that the water now looks green, not from tailings, but from algae. As a lake ages, and is more productive in terms of biological material and particularly the plankton, it will change in appearance. So there is a concern in regard to the soluble matter as it relates to the appearance of the lake as well as the particulates.

It is my understanding, if my memory serves me right, that one finds in looking at the data which the company reports to the State in regard to their solubles in the intake and discharge water, that there is something in the order of 30,000 or 40,000 tons a day of soluble material being added to the lake as a result of solution of the particulates into the processed water stream.

Other studies done by various people put this range up as high as 80 or 100 tons -- excuse me -- pounds -- I said tons -- 30,000 pounds per day, up to 80,000 to 100,000 pounds per day.

This is the reason why I feel that the clarified overflow must be recirculated with assurances, and while I would agree that discharging the clarified overflow to the harbor will ensure some recirculation, I don't think it is adequate, and in my judgment I think there should be some physical barrier provided, such as a dike perhaps across the corner of the harbor to ensure that this water is recycled. This would be the primary criticism that I would have of this proposal in regard to the soluble materials.

MR. STEIN: Let me try to rephrase this for at least the purpose of the poor lawyers and others.

Do you believe that the plan as presented by Reserve will not provide adequate interception and recirculation of soluble materials and that additional interception, such as by a barrier across the bay and recirculation of the materials, would prevent less of the soluble materials getting out into the lake and thus preserve the quality of the lake water? Is that correct?

DR. MOUNT: Yes. I think there are actually two considerations here. One, of course, is the fact that there would be less lake water used in this system, since you would be reusing what has already been taken into the plant. In talking with my staff members, it is our judgment that if this water is recirculated, there will be an increase in the inplant water of dissolved solids which will in turn result in less solution taking place. This is comparable to putting sugar in a glass of iced tea and as you put more in, it dissolves slower.

DR. WEINBERGER: I would be happy to respond, Mr. Chairman. I don't know how one would proceed.

I think Mr. Fride indicated that the plan as presented, although it does represent preliminary engineering plans, the point raised by Dr. Mount -- and, again, not to try and upstage him -- this was a question which I, too, raised with Reserve in terms of trying to make sure or maximize the degree of recirculation.

If this is something which is desirable and can be accomplished -- and I think it can be to a considerable extent -- I would say that -- I am saying this off the cuff because I haven't even checked it -- I am sure that Reserve would be quite anxious to work on this, and I think it is a technical problem as to how the recirculation is brought about.

I would say that the recirculation should be maximized. The only thing I am saying, Mr. Chairman, is whether it be in the form of a curtain or what form that should take, I would rather that would be --

MR. STEIN: That is a technical question.

DR. WEINBERGER: Yes, sir.

MR. STEIN: Let me get to this, and let me check with Dr. Mount because I heard him say that this was his principal objection. And, of course, we haven't called signals in advance, and I don't think this just happened this way. But I raised this as the first question, because I think we came to the conclusion about Reserve contributing to interstate pollution at the last conference on this question of the introduction of the soluble materials and nutrients to the lake, which contributed to the aging or the eutrophication of the lake.

Now, if Dr. Mount is concerned with a plan to protect the lake, I think that naturally he is concerned about protecting the lake from these materials getting in there and affecting the rest of the lake.

Now, whatever the technical solution is, I think the answer to this is directed at the gravamen of the finding that the conferees made in relation to discharges from Reserve and eutrophication. And I would suggest that this question be resolved between you, the State and Federal technical people, possibly before we can really go ahead with the plan, if this is going to be a major issue.

DR. WEINBERGER: I am sure that, again, I personally, and I am sure Reserve would be very happy to go over this.

Again, I think Mr. Skinker did indicate the engineering design which they came up with has been deliberately laid out so that the discharge -- and overflow discharge would be involved in a recirculation. Now, if this is not adequate from the point of view of the engineering, and whether one needs a more positive way of doing this, this is certainly something -- I think it is an engineering problem for technical people.

MR. STEIN: Anytime any of the other conferees want to get in on this, just let us know.

Dr. Mount, do you have any more?

MR. BADALICH: Mr. Chairman, I would like to ask one question as long as we are talking about the overflow from the clarifier.

Dr. Weinberger, what is the relative characteristics of this overflow -- the turbidity, the suspended solids of this material? I am concerned about possibly the discoloration of that harbor not only when you are talking about the soluble material, but wouldn't there be a tendency for this material to drift out into the lake, or something on that basis?

DR. WEINBERGER: Mr. Badalich, the final character of the material, the concentrations involved right now will be based on the pilot studies at the laboratory

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DR. WEINBERGER: Mr. Badalich, the final character of the material, the concentrations involved right now will be based on the pilot studies at the laboratory and pilot studies which are being conducted. Now, in the proposal, there is the suggestion that the need for polymers or some other coagulants to remove the fines would be necessary.

The final concentration, I cannot say at this point whether it is going to be, you know, the magnitude of -- it would depend on the operating conditions and the amount of coagulant you have to add.

But, based on the studies thus far, this would not result in a discoloration or any color impact.

Again, I think as part of the engineering refinement involved in detailed design when it is submitted to the State, it would have to deal specifically with the concentration you are talking about.

MR. BADALICH: Does this mean that the clarifier overflow would be in turbidity less than 25 or less than 5 so you don't have discoloration of the water, or would that be less than 1, which is now the turbidity value of Lake Superior water. Anything over and above that would involve discoloration.

Are you saying you are going to clarify the supernatant down below or equal to the water quality of the lake?

DR. WEINBERGER: I think I misunderstood when you used the word "discoloration." I was using this as color rather than turbidity.

What the turbidity levels will be at this point, certainly we are going to try to reduce these to the lowest value that can be achieved. The purpose of the recirculation is again to make sure that any of the fine particles which might be present, as well as the dissolved fraction, would in fact be recirculated. These in turn would be built up and be settled out upon recycling. This would have to be designed so it does not create this kind of a turbidity problem.

MR. BADALICH: So you are saying at this point there is reasonable assurance that there will be no problem of this overflow material drifting out into the lake; there would be some preventive measures to avoid this?

DR. WEINBERGER: I am saying this is the way this thing has to be designed, and in the preparation of detailed plans and specifications submitted to your people, all of you are going to have to be assured that this will not take place.

MR. BADALICH: Now, going to the flocculent being used, will this have any biological impact on the waters in the immediate area? Will there be any stimulation of algal growth or anything like this; or aren't you sure yet on the type of flocculent to be used?

DR. WEINBERGER: Again, I appreciate you are getting involved with me on technical questions. I can respond to this in part, and when I don't know I am going to tell you.

Again, one of the great concerns which I had was any addition of anything to that lake water. And, again, frankly this is one of those things that in weighing the alternatives it is a question here of reducing -- of getting the fines down. And it was apparent that by plain settling one could not remove as much of the fines as would be desirable.

Looking at any coagulants, the first question, of course, again that I raised was: Are these coagulants safe, and how do we know they are safe?

The Reserve consultants had been working with these things in terms of getting those polymers, if you will, that have been approved as polymeric additions to drinking water or water treatment plants. I want to assure the panel that this was not adequate or is not adequate as far as I am concerned. And I would urge that before they use any of these they make sure that these are subjected to appropriate biological testing so that not only will they be safe from the point of view of human consumption, which we already are aware of, but that also appropriate tests -- and I am hoping that Dr. Mount would participate in this thing -- so that one can develop appropriate aquatic biological testing to be sure that these would not contribute to it.

At this particular point, we have assurances that they are safe from a drinking water, health point of view. And I might say something else on this, because these are again questions that I think we would all ask. We do have some preliminary information from some of the users of these chemicals or these polymers and coagulants, that they have been used in drinking water supplies and in treatment supplies being discharged into very high quality streams where there has been no measured effects on fish and aquatic life.

We would, however, still insist that appropriate tests be conducted.

MR. BADALICH: However, the point being right now that the present discharge of Reserve does not use the polymers or the flocculents. This is going to be another added area that we are going to have to be very concerned about if this method of disposal is going to be used. We are not confronted with that problem at the present time, but we are adding another constituent to the discharge and this is of great concern -- especially the biological effect.

MR. WEINBERGER: Mr. Badalich, I agree with you completely, and I would say that one is initiated and is going to carry out every possible test. As I say, we have a good body of information concerning the health effects, but, as some of us know, sometimes the effects to fish and aquatic life would be more subtle.

MR. STEIN: I wonder if I could call and ask if Dr. Mount might have a comment at this point, because he is our national expert right in this field, and it is just fortuitous that he is located in Duluth. But if I were going to ask about the question of effect of a flocculent on the fish food chain or the biota in any freshwater I would get in touch with Dr. Mount.

DR. WEINBERGER: I agree.

MR. STEIN: So I wondered, can you comment on this?

DR. MOUNT: Well, I think there are a number of considerations even beyond the -- well, I guess John covered it when he said ecology, that it is in about everything.

There are several areas of concern within the problems of ecological effects. Certainly the direct toxicity of these materials to the organisms in the lake is one which I believe is not available on most of these materials.

I might mention, Mr. Chairman, that I spent a day at Reserve last week with their technical people asking a lot of these questions so that I could do some homework on this thing, and I do have information on these flocculents from the makers or the companies.

Now, I have a whole pile of them here because there has not been any choice made, and for the most part there is inadequate aquatic toxicity information on these, and this would require I think some rather extended testing, particularly on organisms -- specifically the lake trout which has not been looked at. If there is one thing I have learned in this business. that is you don't extrapolate a lot or estimate the toxicity of a chemical to a species because you have tested a goldfish or a guppie. It doesn't work this way.

There are other questions which I cannot answer in my own mind right now, and that is in regard to whether or not the flocculent that might be chosen should be degradable or not degradable. I can see pros and cons either way on this one.

If you want me to go into that a little bit

I can. I am not sure you do.

MR. STEIN: I am not sure we don't. Here is the situation. I agree with Mr. Badalich completely. I think you are going to have to give us the amount of time that it is going to take to get answers to this whether we can reasonably expect a positive answer, because I think that Mr. Badalich's point is a very poignant one.

In dealing with a body of water like Lake Superior, we are not going to put in any extra material without knowing what effect it is going to have on the biota of the lake or the ecology.

Now, this is a key point. In fact, there are possibly two key points in the proposal as they relate to the ecology. One is this recirculation question and how you are going to keep the material in solution from getting out into the lake, which is the same thing. The second thing is any possible deleterious effects of any additives that we are going to put in by a flocculent. Unless you can sign off and tell us that it is benign and that it is not going to hurt the biota, I think we have a very serious question on the plan.

This is one thing we must get over, so I wish you would keep on and give us an indication of how long it is going to take you to check this out and test it.

DR. MOUNT: Well, since you have given me an open ticket, I am going to start out with a little sermon to begin with, and that is that I am not an ecologist and I don't suspect there are very many in this room who are ecologists. Everybody calls themselves this, but there aren't very many around really.

I have had a full year of ecology in formal training, and one of the principles that one learns early in ecology courses is that every organism, whether it is a bacterium or a man, changes the environment in which he lives. And so I think that this is a principle which has been long established and we must accept that anything we do is going to have some kind of a change somewhere.

I think our concern, therefore, in this field is which changes are going to be undesirable or detrimental or significant enough to be concerned about?

The purpose of the National Water Quality Laboratory really is essentially this: to find out what the effects on the ecology are. And so I would be betraying my own organization if I said that I didn't think we could do a decent job of finding out what these effects will be. This is not to say we don't make mistakes, but

I think for the most part we are able to pretty clearly measure these effects.

This would involve, as I have indicated before, testing with the organisms that are important in the lake.

I would like to discuss this degradability, nondegradability for a moment. As I understand the process, there would be some small percentage of water associated with these thickened tailings that go down to the bottom of the lake. It is also my understanding, from the company's technical people as well as my own staff's knowledge of these flocculents, that the vast bulk of this flocculent would be incorporated into the tailings, the solid material, on the bottom. If these are truly thickened and flocculated, they will pile up in a thick layer very close to the plant, as Reserve's drawings have shown.

This means, therefore, that we will be burying the electrolytes -- polyelectrolytes or the flocculent in the tailings and covering over repeatedly so that they will get a thick layer of a mixture of tailings and these flocculents.

Now, in regard to the degradability: If the material is degradable, it is our thinking that this material would degrade by bacterial action most probably, and that this would use the oxygen, and that there is a good probability that the sediments would be anaerobic. This means depleted of oxygen. .

If that happens, we can envision some undesirable chemical solutions taking place that might not take place if the conditions are aerobic or with oxygen.

On the other hand, if the materials are not degradable, there will be a small amount of this perhaps going into the water, and the question then is what will become of that? I don't pose these as questions which cannot be reasonably answered, but I am saying that we don't have the answer right now to this. At least I don't feel that I do.

Those are the kinds of questions, I think, we must look at. We need to have an analytical method, for example, to measure these flocculents, so that we can find out where they are going.

Now, I did talk with a maker of one of these potential flocculents, and he assured me that there was available Carbon 14 labeled material that we could use to raise this material both in the lake as well as in the experimental work. This is a big plus. That same one has been used, according to the representatives in the public marina area in Florida -- several of them are listed -- in which they have used these flocculents at approximately the 3 p.p.m. concentration range -- the range that probably would be used up here -- in recirculated systems where we essentially have a good bioassay test performed for us on a rather long-term basis. So we are not without any information, but all these things would have to be looked into, and we are talking some months of work to do this.

MR. STEIN: Could you put a figure on that? Would it be 4 months?

DR. MOUNT: We would be well into having a good feeling for it I think, depending on the particular time of year we begin this. But assuming we began now, it would take in the range of 9 months to test this. But we would be getting some indications as we go along and we might be able to rule some out well before this. But I think we would have to look at this, of course, in the lake even after it is done, so that stage of testing would never be completed until the full installation is in place, but we are talking 9 to 12 months I think.

This is not a consideration of how many people that are put on to work, but rather these organisms don't seem to listen to us when we tell them it is time to reproduce; they wait on the annual cycles.

MR. STEIN: Well, I understand that.

I was going to address myself to the legal complications or implications of this.

If what you are saying is true, you give us two choices: 1) waiting perhaps 9 months until your work is completed before we come to a determination on the method; or 2) if we go ahead with this method, that the industry is ready to go ahead with its plans and spend its money with the notion that they are not going to use a flocculent that you are not going to approve. This may be a hard choice for the industry, and I don't know how the industry would feel if your proposal, Dr. Mount, is a prerequisite. I don't know what the industry would consider in that light.

By the way, I have one general question to ask. You don't have to answer it here. But onland disposal -- would we have this water that we have to take care of anyway get to the lake? What would we do with the water?

In other words, what I am asking you, Dr. Mount, is: Do we have the same kind of problem if we have land disposal as well as water disposal, or don't we have to use a flocculent to get the material out and put it on the land?

DR. MOUNT: I don't believe I can answer the question whether they need a flocculent or not. I guess that is a company problem.

DR. WEINBERGER: I think Mr. Frangos answered that partially from experience yesterday.

One of the considerations, Mr. Stein, in terms of the problems of land disposal and the diking area is, of course, the question of the drainage area involved and the impoundment of water and the overflow from these. And, again, I think Mr. Frangos, before we even made the presentation in response to questions of the fines, pointed out that the overflow or the bypassing of this would have fines in them. And much of the area around this particular installation would drain into Lake Superior. So that if one were going to go to onland disposal, chances are quite good that one would have to have, if you will, similar type of treatment for the removal of fines.

Again, I just would say that if one could remove these fines by gravimetric means or without the use of things this would be delightful because -- and I don't say this thing tongue in cheek -- but in response to Dr. Mount with whom generally I agree -- neither Reserve nor myself has any preconception in terms of a kind of polymer, and I certainly assure this again, and the technical people realize the variability of cost, and we are talking about very significant cost differences. One is not looking at polymers from the point of view of cost, and if it requires a polymer that costs 60 cents a pound as compared with one that is 30 cents. that is pennies. So what I am saying then is I think the question here is: 1) we probably have to have some coagulant to deal with the overflow water, and 2) that in terms of Dr. Mount's questions, the coagulant that would be used, as he indicated in his preamble, would be the one which is most preferable.

Again, if I may make an aside, just going along with his initial comments -- and I see eye-to-eye -- I for one would be happy if we didn't have a problem, and then we wouldn't have to be concerning ourselves with alternatives. And I would say what we are weighing all through this thing, Mr. Stein, relating to the land disposal or the present disposal the use of coagulants or not the use of coagulants, the use of high degradables or nondegradables --

MR. STEIN: Let's assume the program is going to require the use of a flocculent, and let's assume that Dr. Mount is going to need the 9 months to give you the proposition for the action program that the State and Federal program are going to have to face. I think we have had this case so long it doesn't seem to me likely that I would recommend that we wait for another period of testing to be completed before we decide what kind of remedial measures to embark on. We have been here for years.

Which leads us to the proposition that if we embark on a method, we certainly would not want a flocculent utilized which was not approved by State and Federal authorities. Thus, it seems to me that we have this problem here on a program which might go -- and I am not talking in terms of land or water disposal; I am just talking in terms that if you are going to use a flocculent and we need these 9 months that we presumably are going to have to have to sign off, or if we are going to make somethi on a program that we can start now—with the understanding that an adequate flocculent will be found and that the company will pledge itself to use only that kind of flocculent in that manner which is approved by the State and Federal authorities. Because otherwise I think we are caught in a time bind here and I think time has run out on us.

So you have to make a judgment on how the compan would go on that.

MR. WEINBERGER: Well, I think it might be a legal question, and I would like to make a comment after that. You know I am not ashamed to talk, but, Mr. Fride, I don't know whether this involves some legal question concerning that.

MR. FRIDE: Excuse me, Mr. Chairman. The purpose for my departure from the stand was to go to ask Mr. Furness, the President of the company, and he certainly authorizes me to pledge to the conferees and to the State agencies and to the Corps of Engineers that if approval is forthcoming for the adoption of this engineering plan, that the flocculents or coagulants which would be utilized would be utilized only with the reasonable approval of whoever the Federal and State agencies would designate to do that.

Certainly we would expect and welcome the judgment of Dr. Mount in this area because, as you have pointed out, he is equipped to handle this kind of a situation, and certainly we want the State of Minnesota obviously to approve the flocculent. So I can say, without really any reservation, that we would recognize that the implementation of the plan would be contingent upon approval of the flocculent.

MR. STEIN: Approval of the flocculent by both the Federal and State agencies.

MR. FRIDE: By the Federal and State agencies.

MR. STEIN: Right. Thank you.

DR. WEINBERGER: Mr. Stein, may I add something? I was going to add this even before Mr. Fride came up.

Dr. Mount said something else in terms of his being concerned with an effective continuing monitoring program.

Again, I would say this personally, regardless of my relationship to Reserve, that I would certainly urge that even if approval is given— and let's say based on the evidence that we have that what we are talking about seems to be an appropriate solution—the monitoring be carried out, and in the event that at any time in the future one finds that there are some adverse effects developing or appearing to develop one insists that a modification takes place.

MR. STEIN: I can assure you, Dr. Weinberger, that is precisely what we are going to do whether you suggested it or not.

DR. WEINBERGER: With regard to the polymers or coagulants if it were --

MR. STEIN: That is our business.

Let me make this clear: We are not just doing this with polymers or anything else; our job is to have continuous monitoring of these waters, and if we find that a treatment system doesn't work or a discharge system is deleterious, we are going to seek its correction.

DR. WEINBERGER: I apologize. I for the moment slipped over to the other side of the table.

MR. FRIDE: If I could just add one other note to what I am sure is the concern of all of us, and that is the time question.

MR. STEIN: Yes.

MR. FRIDE: The plan, as you have it before you, contains I think a very significant departure from that which might ordinarily be found in plans of this kind, and that is that the engineering plan contemplates not only the final design plan and construction but what it contemplates is that the things be carried on simultaneously. In other words, that we don't wait until every detail is in the final engineering before we go forward with purchases, construction -- these kinds of concerns. So that the overlap time for final design and construction then can be so put together that once approval is reached, you would have two years to construct and make operable the facility. And I think that is a very significant kind of thing because ordinarily were it not thus we would be talking in terms of a much longer time frame before the system could become operable. And I would say this, too: Dr. Mount raises the possibility of a 9-month program, and a continuing one to ensure that we are having no adverse ecological effects from the utilization of polymers in the clarified water, or whatever it might be, and we certainly subscribe to this.

I would say, however, that with the kinds of reasonable cooperation that I think both the State of Minnesota and the National Water Quality Laboratory and the entire Environmental Protection Agency, as well as with the cooperation of the representatives of Michigan and Wisconsin, that we can all work together to put the time frame to the smallest part, i.e., to go ahead with the design, with tentative construction, subject, of course, to approval contemporaneously with the testing of the flocculent and the assurance that whatever flocculent is ultimately selected is one that has no adverse aquatic reaction.

So I think that we don't have to wait the 9 months to go forward, assuming, as I have said, that we can get the requisite kind of approval.

MR. BADALICH: Mr. Chairman.

MR. STEIN: Yes.

MR. BADALICH: We seem to be sort of hung up on this flocculent.

Mr. Fride, or someone from the Reserve Mining staff, was there any consideration given of taking the total volume of material and conduiting it directly down to the bottom of the lake?

MR. FRIDE: I can give you the answer that I have. Obviously this is not a technical one. We can call on these gentlemen -- if these gentlemen want to comment on that.

Yes, there has been consideration to that. I think among other things that one is concerned with trying to get as thick a slurry as is possible, so that you would tend then to have it settle as promptly as possible. To the extent that you add all the volumes of water, as I understand it at least, it inhibits the formation of as thick a slurry as perhaps you might otherwise have.

Perhaps one of you gentlemen would like to comment on it with more particularity.

MR. SKINKER: Mr. Chairman, in my remarks describing the plan, I indicated that one of the first things to do was to cut down on the volume of water as much as possible, in order to take advantage of having as dense a slurry or pulp as possible for transport and for deposition purposes.

The minute that you begin to increase the volume of water to dilute it, you tend to create problems of turbulence which results in further turbidity. To my understanding this is one of the things that you want to overcome or avoid. Consequently, I would not recommend that you attempt to take 302,000 gallons a minute of water plus solids to the bottom of the lake. I would a whole lot -- I do recommend that you attempt to take about 7 to 8 percent of that, which is 22,100 gallons per minute, to the bottom of the lake.

MR. BADALICH: Mr. Skinker, you feel, then, that if you did deposit the total amount of material now to a depth of 900 feet, which is the depth of the trough, that there would be an upheaval and this material would go to the surface? Is that what you are saying?

MR. SKINKER: No, I did not say that. I said that the rate of deposition and the resultant compaction of the material is going to be much more positive if you have less water introduced with it than if you dilute it, and that is the reason we are making a separation.

MR. BADALICH: Mr. Chairman, I have another question --

MR. STEIN: Go on.

MR. BADALICH: -- regarding the volume of discharge at the present time, Mr. Skinker. I understand it is about 400,000 gallons per minute, and in your report you indicated 302,000. Where is the 100,000 that has been lost here someplace?

MR. SKINKER: We have had these figures checked, and wherever you got the 400,000 gallons, we would consider this an erroneous figure; 302 is what we have.

MR. BADALICH: That is the present discharge?

MR. SKINKER: Yes.

MR. STEIN: Any other comments?

MR. MAYO: Mr. Skinker, it appears that the use of coagulants is pretty specific to the kind of solution that you are suggesting --

MR. SKINKER: That is right.

MR. MAYO: -- for the thickening and placement of the material in the lake.

Would there be any prospective use of coagulants if another plan or departure from this system were considered?

MR. SKINKER: If the presence of fines in the overflow water is a problem, in all probability you would have to use some form of coagulant or agglomerate or flocculent to pull them together and depress them.

MR. MAYO: To pursue a little further the point that Mr. Badalich raised about taking all of the material out into the lake via pipeline, on the basis of the 302,000 gallons per minute versus the 22,000 gallons per minute.

Taking all of the material out, with the 302,000 gallons per minute, of course, would not reduce the soluble materials at all. We would be faced essentially with the same load of the soluble materials going into the lake.

MR. SKINKER: This is true. However, these soluble materials are a very minor concentration.

MR. MAYO: Dropping that to the 22,000 gallons per minute, would you venture any estimate of the extent to which the amount of soluble material will be reduced, or would be reduced?

MR. SKINKER: Well, I think it is pretty well understood that with respect to solubility that the lesser volume and the more of the soluble material, or even the same amount of soluble material in the lesser volume, you will reach equilibrium of solubility sooner with the smaller volumes of liquid. That may be an odd way to state it, but I am trying to put it in practical terms.

MR. MAYO: Anticipating the recirculation of the clarifier overflow and the discharge into the lake of just the 22,000 gallons per minute, what range of reduction in the solubles might be expected -- 90 percent reduction, 95 percent reduction?

MR. SKINKER: I would think it would be on the order of 90 to 95 percent, because you would, in effect, be endeavoring to pull back at least 92 percent of that fluid.

MR. STEIN: Are there any other comments or questions?

Again, if Dr. Mount's statement is correct that the more you recirculate it the less soluble materials are going to get out, I don't know, maybe this should be figured out. But it should go closer in the higher nineties than you talk about if his theory is correct, as I understand him --

MR. SKINKER: Well --

MR. STEIN: -- because you computed this on a straight volumetric mechanical operation --

MR. SKINKER: That is right.

MR. STEIN: -- whereas Dr. Mount indicates it to be a quantitative reduction in solubility as you thicken. You increase the solids of the recirculated material.

MR. SKINKER: I would subscribe to that too, but I can't just give you the answer off the top of my head.

MR. STEIN: Dr. Mount.

DR. MOUNT: I would just want to reiterate again that I think that kind of reasoning is contingent on some sort of a physical barrier in this harbor.

MR. STEIN: Yes.

Now, again --

MR. SKINKER: Well, may I say this: Although it is an engineering detail, it is one that we have well in mind. And, in effect, any overflow water introduced into the harbor for recirculation through the plant would be introduced in a well, which would tend to fence it off from the rest of the harbor, and it would not get into the harbor until it reached quite a depth if any got into the harbor.

It is necessary to have approximately 8 percent of the water as fresh makeup, and that would be coming through the intake from the harbor plus what has been recirculated. Now, that is mechanical.

MR. STEIN: Dr. Mount, do you have any other areas you want to pursue on this?

DR. MOUNT: Well, we really haven't talked about the fences yet themselves, and that is a tough one I think.

To begin with, I think I would agree with Reserve's statement that they made earlier--that the physical filling is not a problem. As a matter of fact, this deep water is essentially barren of producing food organisms and that sort of thing, so that I don't really feel that if one looks at the possible total amount that might be put in, this is of importance. I would dispense with this consideration.

MR. STEIN: Well, I would like to flag that for the conferees. As far as I can see, this is a very important consideration for the conferees if you accept this -- that the physical filling is just an inert material and something that isn't going to cause a problem and is of very little importance to the ecology in the lake. Is that what you are saying?

DR. MOUNT: That is what I am saying.

MR.PURDY: Mr. Stein.

MR. STEIN: Yes.

MR. PURDY: I don't disagree with Dr. Mount's technical appraisal here. But again, in say my consideration of this particular problem, I also agree with Governor Lucey's statement yesterday -- that when we look at new situations I believe that no repetition of this disposal technique should be considered say from a standpoint of the present method or the alternate that I have heard here today.

Now, this may be appropriate to solve the problems that exist at this plant, so I hope in all future operations that we can solve them in a different fashion, because it bothers me to put this much material in the lake. (Applause)

MR. STEIN: Mr. Purdy, I am glad you gave me an opportunity. I couldn't agree with you more.

In dealing with this situation, whatever the disposal system -- whether it is the lake or onland or whatever -- I think we are dealing with accepting the lesser of the evils probable, which is bad from any kind of environmental operation. Now, in a philosophic sense, we also had a somewhat analagous problem when we were dealing with the uranium milling plants out west during the fifties and early sixties. We had to get remedial measures which prevented them from putting radioactive materials in the water courses. The real solution to the problem was that we would permit no more plants to get down there. Once we put them over the Divide on the dry land that solved our problem.

Now, I would agree that I think probably the most important lesson we learned from this was that if you want to protect the environment, the first consideration and the best line of defense is intelligent site selection. If you are going to put a plant down at a water course here that has a lot of material that they are dumping into a public water, you have given us a problem. And I think, Mr. Purdy, you have presented this,and, as far as I can see, Reserve has presented us with a mammoth problem. That is why we are here.

Just the basic fact of anyone, at any time, making a decision to put 67,000 tons a day of any kind of material in a pure body of water like Lake Superior, has got to present us with a problem. I hope there won't be a repetition of that.

MR. BADALICH: Mr. Chairman, may I ask a question at this point? If an onland disposal system were used, can anybody give us a comparison of cost compared to the proposal we are hearing here today?

MR. SKINKER: Preliminary estimates indicate that for an onland disposal system that there would probably have to be spent in excess of $70 million to install it, and then its operation throughout the year would be substantially more costly than that which we ascribed to.

MR. STEIN: Is that for all locations you considered?

MR. SKINKER: This is for a plant that we would consider the further you get from the existing concentrator the more costly it would be.

MR. STEIN: Yes, but what did the $70 million apply to?

MR. SKINKER: This applied to an area -- what do you call it? -- somewhere near Lax Lake; somewhat south of there. It would not involve the lake itself.

MR. STEIN: Have you figured what it would cost for the land disposal to go to the low land above the plant and put a dike in, onland disposal? I have heard that mentioned as one of the possible sites. That may be a little closer.

MR. SKINKER: I don't quite follow you as to where you mean, Mr. Chairman.

MR. STEIN: I understood there was a place other than Lax Lake where you could build a dike barrier possibly -- at least this is a theoretical possibility -- along the shore of the lake, and put the tailings behind that dike.

MR. SKINKER: Well, I think you would have to build some form of impounding dam anywhere you put them, if you put them onshore, and you would still be faced with these problems of erosion, of overflow, of fines in the discharge.

MR. STEIN: I recognize that. I think the question that Mr. Badalich raised was the cost factor. Now, is this the cheapest possible cost factor? Would this relate to a particular site that you were going to put it on?

MR. SKINKER: For an onland disposal system that would have a reasonable degree of operability, let's call it. This is probably as cheap as you could do it.

MR. STEIN: For any of the sites that you are aware of?

MR. SKINKER: Well, as sites get farther and farther inland it gets more expensive.

MR. STEIN: But this is the cheapest price you can come up with?

MR. FRIDE: May I address myself to that?

MR. STEIN: Okay.

MR. FRIDE: Because obviously Mr. Skinker's organization is one of five that has been considering this problem.

... Cries of "Can't hear you"...

MR. FRIDE: Mr. Skinker's organization is one of five, as the conferees know, which has been addressing themselves to this problem. And I would just point out that in the files of the conferees are contained specific engineering cost estimates of various other kinds of proposals, particularly in one that was presented to the conferees in April of 1970, which related to a total disposal in the Lax Lake area. The Trygve Hoff and Associates organization in Cleveland estimated the partial capital cost at $195,183,000 which does not include such items as land acquisition, preparation of basin area, financing interest, distribution, pumping equipment, transmitting power, permanent dams, and that sort of thing.

There are numbers that are available to the conferees of these various concepts, but the point that I really wanted to suggest was that the engineering plan that has been selected here is by far not the cheapest method of all of those that have been studied. It is significantly higher than many of them, but because of the engineering and ecological concerns, this was the one that was selected.

MR. STEIN: Yes.

MR. FRIDE: It was not selected on the basis of price.

MR. STEIN: I wonder if you would bear with me. I don't want to be mean about this,but in item -- Proposal 13, the last time, there was something called the lakeshore tailing pond, and the engineering study was done by Parsons-Jurden Corporation. That is the same one presumably that did this.

MR. FRIDE: Yes.

MR. STEIN: Now, this is the one I was talking about. I didn't find this. But it talked about total estimated partial capital costs, $31 million; or the estimated partial capital cost of the proposal, $37 million; and operating cost for about $3 million.

Now, this seems to -- and I am just raising the question -- in other words, figures like this, if we are talking in terms of a lakeshore tailing pond, would be a little below the $70 million.

MR. FRIDE: That is certainly correct, Mr. Chairman.

I might just say, from the company's standpoint, with reference to this particular proposal 13, as you will note in the material, it does point out that that proposal, while it was certainly one that was considered, does include some quite undesirable features. Too, after 30 years of operation, the basin would be 280 feet above the lake level, virtually eliminating the present site or the village of Silver Bay.

The kinds of problems that would flow from that kind of a plan were considered to be so significant that it was decided that it would not be the engineering plan of choice. About half of the fine tailings and the ponds would be covered with water at one time or another. When they are dry you would have a substantial dust problem. So it was on the basis of these kinds of considerations that, while that plan was engineered and was considered, like everything else that was proposed, it was for that reason decided not to be the one of choice.

MR. STEIN: Thank you.

MR. MACKIE: Mr. Fride, I noticed that in your plan you indicate that there are some six other companies in Minnesota who are producing pellets by similar processes. How do they dispose of their tailings?

MR. FRIDE: Well, the tailings, in general terms -- perhaps Mr. Skinker would speak more to this because he has designed and constructed at least one of the major ones -- in general terms, are in a settling kind of a basin.

I might just suggest this consideration: that all of us -- I am certain all of the conferees -- are dealing with practical and real siuations. Now, the decision to construct the plant where it was constructed was premised on two important and critical features. If it were possible to so construct this plant that all of the facilities would have been located at the mine site, as most of Reserve's competitors are able and were able to do, then obviously the site of choice would be at the mine. Certainly nobody with any kind of an economic sense transports material 47 miles by railroad when you transport two or three times more than you need. Obviously the site of choice would have been by the mine if there were available there the two prerequisite things-- normally the supply of water, and an area in which a settling basin could have been constructed.

It so happens that at the mine site, the property that Reserve Mining Company owned and was going to develop, the Continental Divide runs just about through it. You would have no low-lying area in the vicinity, as the other companies closer to the West do have, for the proper and appropriate deposition of tailings.

Secondly, all of the companies must use necessarily in this process substantial quantities of water, and, again, there was not water available at that mine site. So that is the reason, of course, why the plant was built where it was built. But -- and perhaps just to repeat something that has been said before -- but I think sometimes we may lose some of the significance of it. Almost all of the kinds of considerations that are now being given to this operation were, in fact, along those considered before the necessary authorizations were granted by the State and Federal agencies to construct this plant. To be sure, today's situation may be a little different, but I would just suggest that in bold terms, all of the kinds of considerations were given before the plant was built, but that is the primary reason, as I am sure the conferees are well aware of why the plant was built where it was built.

Perhaps Mr. Skinker, you would like to comment more particularly in response to the question as to how other operations in Minnesota, or perhaps in other States, do handle their tailings.

MR. SKINKER: Fundamentally, I think Mr. Fride has covered it quite thoroughly.

In Minnesota, the other iron mining and pelletizing companies do have the benefit of natural water supplies where they are located, adjoining their mining operations. And they have been able to secure land -- and lots of it -- where they would have room to dispose of the tailings materials, but I believe the majority of them are faced with this problem of building rather large impounding structures or dams or dikes -- whatever you want to call it -- in order to contain these materials.

Elsewhere in the United States, where there are concentrating operations created daily, such as in

Arizona, in Montana, In Utah, in Nevada, in New Mexico, tremendous amount of tailings are generated by the copper mining industry. Their tailings are not quite similar to these tailings, and they pose some similar problems and some other problems for their disposition.

But, again, in most every instance, they have to build some form of dam or holding structure in order that they can dispose of these tailings. And they, again, have similar problems with the overflow waters, with the dusting problem, with the erosion, with dike failures at times, as well as the normal operating problems that they have.

MR. BADALICH: Mr. Chairman.

MR. STEIN: Yes.

MR. BADALICH: Could I ask Mr. Fride a question?

Mr. Fride, I assume by your remarks just a few minutes ago that you are stating now and it is your best belief that any onshore disposal system that can be developed to alleviate this problem would not be practical.

MR. FRIDE: I think -- it is my understanding from the many consultants, the many people that have been talked to who have considered the problem, that from the point of view of sound conservation, technical and economic feasibility, that the plan that Parson-Jurden has presented to this conference is the one of choice and is the best suited to accomplish those aims.

MR. BADALICH: So, then, from that answer I can assume that any other method is not practical other than the one you are proposing today.

MR. FRIDE: I think in general terms that is correct.

MR. BADALICH: The reason I am stating that is our interstate Water Quality Standards, which are also the Federal standards, very clearly indicate that to meet these standards that the highest and best practical degree of treatment must be found for any solution of any discharge.

So, in this case, the plan being proposed today is the highest and the best practical solution for this problem?

MR. FRIDE: That is the best judgment that we have, Mr. Badalich.

MR. BADALICH: Thank you.

MR. FRANGOS: Mr. Chairman, I would like to kind of follow up on that question, and you did present us a number of alternatives with some evaluation and assessment back in April, and then in August.

I guess my question is, Mr. Fride: Do you have a number two selection?

MR. FRIDE: No, sir.

MR. STEIN: Any other comments or questions?

Did you have any, Dr. Mount?

I would like to make one thing clear that possibly is not clear because as a statement -- and I heard this from some of the other panel members -- in your proposal, it is proposed to take the fines and dispose of them at the bottom of the lake, amalgamated and coagulated possibly, but that is where they would rest, is that correct?

MR. FRIDE: Yes, sir.

MR. STEIN: Right

Mr. Purdy.

MR. PURDY: Mr. Stein, this is not a question; more observation I guess.

From the standpoint of an interstate matter, it seems to me that whether we are discussing onland disposal with tailings or the system that we are considering now, that we have to deal with the problem of dissolved solids and the flocculents and that if those matters can be resolved in either case, why this takes it out of the interstate problem.

Again, in view of Dr. Mount's comments from the standpoint of the inert solids deposition, this does not cause a problem in the lake; this takes it out of the interstate problem. However, for it to get out of the interstate problem something has to move forward. Mr. Fride indicated yesterday that if there is approval of this project that there would be no further litigation on the part of Reserve. So it seems as though this represents a real critical decision at this point in time not only on behalf of the conferees but the State of Minnesota and the Corps, from the standpoint of the Refuse Act.

In addition, for my benefit, I still would like to see something like an environmental impact statement presented to my technical people for their review, which would deal with the, say, specifics now of the choice to dispose the tailings in the lake as compared to some onland disposal site. It still seems a rather unusual approach of where you put in a treatment facility and separate two streams and put them back in the same spot, more or less.

And so I would like to see an environmental impact statement that would consider those two choices in further detail so that I would have more information available to me.

MR. STEIN: I know of one major city waste treatment plant that provides secondary and primary treatment for part of the wastes and puts both effluents in one pipe and sends them out.

MR. PURDY: That is the type of strange thing that it seems like.

MR. STEIN: Are there any other comments or questions?

MR. MAYO: I would like to just exchange a comment or two with Mr. Purdy at this point, in terms of the preparation of an environmental statement or an environmental appraisal.

Reserve laid out 19 alternative proposals for disposal and essentially all of them -- most of them -- onland.

If there is going to be any thought of an environmental appraisal, I think we have to be in agreement on its scope. So to try to start out and evaluate all 19 of the Reserve alternatives, plus the recommendation that is before us at the present time, would be an extremely drawn out task that is not at all in keeping with the kind of time frame that we are all faced with here.

MR. PURDY: Right.

MR. MAYO: So, if you would, I would like you to make some comment on what you think the scope of an environmental appraisal in your mind might take.

MR. PURDY: Certainly their Proposal number 13 that the Chairman just referred to, and then the other proposal discussed by Mr. Skinker that included the Lax Lake area.

MR. STEIN: I have seen this, I have heard here and outside, and there may be others. We wouldn't limit these, but there are three proposals that I have heard most frequently mentioned as onland disposal sites. One is the lakeshore site; second is the Lax Lake site; and third is over the hill to the mine site, which will include A and B, 1)putting it back in the pit, and 2) using other abandoned mines or depressions in the area which might be able to accommodate them.

Now, I think these are the three major ones that I have been hearing through the years. Is this correct? Are there any more?

DR. MOUNT: I am not sure I am going to respond exactly to that question. But I guess at the risk of being repetitious, it seems to me that we can see now some of the considerations that are going to have to be looked at in regard to the alternatives as they relate to the effect on the environment. And the one thing that did disturb me yesterday was the apparent feeling that just putting these things on the land is enough. It isn't possible to evaluate right now an onland disposal system because we don't have any of the details of it. But the principles are there I think, and some of these have been mentioned and I think some of them have not been mentioned.

But the dust problem has been mentioned, which I guess really is a part of a larger problem, the whole esthetic -- probably the appearance of this thing is certainly one that does have to be evaluated. If a land disposal system is used, somehow we are going to have to crank this into the evaluation of it.

Secondly, if it is a recreational area, this is a consideration. To me it is the most important one and the one which I think is the reason we have to have a detailed onland plan to evaluate and compare, if we are going to make a comparison that there is no assurance that just pumping it on the land is going to keep the water out of the lake.

There is going to be seepage through the ground if it is on an area that is a bog or if it is on a fill of some kind. This water is going to go somewhere. It is either going to go into the lake or it is going to go into a river, and I do not subscribe that we should take it out of Lake Superior and send it to another river. I think this is burying your head in the sand. So I think we have to be concerned about this water wherever it goes.

Also I have heard comments about pumping this stuff into a bog somewhere, and this is going to displace bog water which is clearly not desirable water either to put in the lake. So those are some of the considerations of onland disposal. By the same token, if we put it on the lake bottom we have got to be sure that it isn't dissolving, that it is staying in place, and that it is not affecting water quality.

So it is tough to make a comparison with one plan against a lack of plan on the other side.

MR. STEIN: Dr. Mount, I have read some interviews with you that people have published in the paper, and I guess we are going to have to come up with that age-old problem of how you scientists deal with lawyers. Now, the difficulty is I recognize all your problems, and this is what I said after the meeting yesterday. The difficulty with coming up with a concept of land disposal as a concept is like someone coming up with an idea for a Broadway show. Everyone has the idea, but unless you have the book and the music, you don't know if you have the show. And when you talk in terms of land disposal or a disposal conceptually you don't have very much. We have to check

D. Mount

this to be meaningful in relation to any individual plan.

Now, the difficulty we have with coming up with any specific plan is you have to charge the person responsible for creating the waste with a remedial program.

As I pointed out yesterday, we heard the Presidentt of the Company Mr. Furness come forward with a plan.

Now, the notion is who is going to come up or finance a specific plan of land disposal? More importantly when we get to the legal point, which Dr. Mount always raises, somehow we don't have a millennium to come up with a decision to answer all of the scientific questions. The job we face is to come up with an answer now that is going to protect the lake.

As I see the problem there must come a time when you are going to stop evaluating a study, make a decision and go into action. This is particularly true in an environmental field where we are getting these pollutants and these vast amounts of material dumped into our waters every day. If we delay perhaps for months or even one day, while we are delaying, Reserve is still going to keep putting out 67,000 tons of that waste material into the lake a day.

As I mentioned several times before, the reason we can't delay on the lakes is that we have this great freshwater body. If we have a delay say in a river or a tidal estuary and we get a cleanup, given some sweeps of the tide or given a spring freshet or two, we may be back as good as new. Every day we continue pollution of the lakes may be water quality lost forever. I recognize Dr. Mount's point of view. But taking all of these things into consideration, we are at the stage where we have to use our best judgement and come up with a solution.

Now, as you know, some of the alternatives we have are very drastic. But we can't any more just let the situation continue while taking a prolonged time for evaluation. I think the time is now that we must come up with this determination. The question is how we are going to get these considerations in one package.

Are there any more comments or questions?

MR. FRANGOS: I have a question of Mr. Skinker. In going through the 19 alternatives or perhaps three or four that you might consider as perhaps within the realm of reason, do you see any of the details of this particular plan that you have put forward that would be also incorporated into any of the other plans or into a land disposal system?

MR. SKINKER: Yes, indeed.

MR. FRANGOS: Well, can you comment perhaps a little beyond that? Let's assume we bought this particular plan and 3 years from now it became apparent it just wasn't going. Are you going to start from scratch, or is there some adaptability or some flexibility here that permits you to state to us that you know once you are committed to this, that it is kind of irrevocable because of the amount of money you are spending?

MR. SKINKER: I think any onshore or inland disposal plan would definitely have to consider thickening of these materials; that is the number one thing. In other words, you have got to get the water to the greatest possible extent out of it so that we can handle it by one means or another for inland disposal. Where you have a similarity you would use a thickening plant of some sort probably very similar to the one that we have described here.

MR. FRANGOS: This would include, too, I suppose, some of the appurtenant facilities. For example, you are talking about water pumps that you would be using now for intake disposal, that perhaps these facilities might be adaptable to go onland or up over the ridge, if you will.

MR. SKINKER: Well, the pumps to which I referred are pumps that are required for handling chiefly the underflows from the various hydroseparators or thickeners. Depending on what kind of a plan we selected for inland disposal, it might require many more pumps and pipelines.

MR. STEIN: Are there any other comments or questions?

MR. BADALICH: Mr. Chairman.

MR. STEIN: Yes.

MR. BADALICH: Mr. Chairman, you spoke earlier that we have to do something about the 67,000 tons of taconite tailings going into Lake Superior daily.

Now, the proposal we are studying here today will continue this practice of 67,000 tons of taconite tailings going into the lake. Instead of smaller accumulations we have larger accumulations.

MR. STEIN: This is right.

MR. BADALICH: So I think it is almost incumbent on the company to come up with some alternative plan on onshore disposal. I think that this should be a detailed study so that then we can make an ecological choice or an ecological balance on whether the method being proposed this morning is the proper method or possibly some alternative or some substitute method, or make an addition to this method. (Applause) So I think this should be required.

MR. STEIN: Let's examine the proposal. I said the fines were going into the bottom of the lake. The issue, as I understand Dr. Mount, is that in a sense, he doesn't think much damage will be done to the lake if all of the material stays in that trough on the bottom. But with the 67,000 tons it is not happening.

Now, if we are going to get someone to come up with an alternate method of land disposal in a detail method the question is who is going to pick that method? Are you going to leave it to the company?

MR. BADALICH: Maybe that should be discussed here. Shall we try to offer some of our engineering expertise or shall we leave it to the company?

MR. STEIN: No, let me put it this way, how many alternate methods are you going to look at? I suggested four that come readily to mind.

The point is that if you leave it to the company, then you are going to be faced with the question that sure, they picked the alternate that obviously wasn't going to stand up to their preferred method and they made this choice. How are we going to get to the kind of alternate land disposal method which the conferees consider the most feasible or the most reasonable of the alternatives for comparison? Who is going to make that judgment?

MR. BADALICH: I think here, Mr. Stein, as any other discharger, we set down the rules of the ballgame. We set down certain standards, and I believe it is up to the discharger to meet these standards.

In this case, the proposal today certainly doesn't meet Minnesota's Water Quality Standards. But, as you know, our standards have been heard in court and they, at the present time, do not apply to Reserve Mining Company.

Maybe this conference should set up some rules or some minimum requirements, and from there let the company meet that particular criteria.

MR. STEIN: Yes. Well, I think this is the question. But I don't know whether we are going to get going unless we select, which as a regulatory agency we have never done and I don't think Minnesota or any of the other States have, We never select the alternate method for the company to go ahead.

Now, I think you have raised a very good point. Without commenting on that State litigation one way or the other, I think it may be fair to say that the implication of the proposal made by Reserve Mining if accepted would necessitate a modification of existing State and Federal standards as we have them on the books.

MR. BADALICH: Yes, it would if we use this proposal.

MR. STEIN: That is correct, and I think that is one of the issues here that the conferees have to face.

Now, again, I don't know if we are ready to go into discussion because I want to save this for the discussion part. We have these problems. At least this is the way I see it. In view of the time and this proposal and the fact that the conferees got the details of this plan just today, which are pretty complicated, we may be well advised to take this plan under consideration for not more than a month in order for the State of Minnesota and the other States to get information, possibly prepared by the company, through Minnesota on the comparative environmental evaluation that Mr. Purdy talked about.

This evaluation should be prepared, in light possibly of the alternatives we have here or some others you haven't thought of, within a very short time and not necessarily going into the details. Again, we should come back with the notion that we have to get a plan either submitted or modified which would satisfy questions as to 1) a barrier in the bay about recirculation, 2) discharge or dispersion of soluble material, and 3) the effect of the amalgam of flocculent or material that is going to cause the tailings to go into these large pieces so they will theoretically settle to the bottom of the lake.

At this point, in a month we should come up with this kind of judgment: 1) whether we accept the plan, possibly as modified after consultation with the people; or 2) whether we ask the industry to develop a specific plan in detail -- and I suspect this will take some time if we are going to be realistic -- for a land disposal site; or 3) whether we proceed under the provisions of Federal and State law to take the next step in abating the pollution situation.

Now, this is a personal opinion on my part but I think we should avail ourselves of this opportunity because for the first time in the development of this case, the company has come forward with a proposal or a proposition which reflects an attitude on its part which leads me to believe that there may be a chance that this case may be solved by negotiation rather than by confrontation.

Whether you agree with the proposal or not, or would want to switch the proposal to modify it to take care of a flocculent or a barrier or recirculation or if you are thinking in terms of accepting nothing other than land disposal, I think we are in the area where this might be solved by negotiation.

I think we possibly can accept in good faith the company's estimate that the proposal now is going to cost $14 million. I believe if they say they are ready to sign a commitment, in my judgment, we don't have a smoke screen or a delaying tactic. This is a serious proposal, although there may be differences.

So, my recommendation is that we take this plan, get your staffs at home to evaluate it, that the other State agencies through Minnesota ask for this environmental evaluation package to come forward and go ahead. It might be a proposal we can work out.

I don't think in view of all of the questions raised here that we can probably ask the conferees for a determination on this now, particularly when you have just received the details of a relatively complicated proposal that has very significant environmental implications.

MR. MAYO: Do you want to speak to that now, Mr.

Chairman?

MR. STEIN: No, I just put that out because I think we can go on that now.

Now, are there any other questions of Reserve?

MR. WEINBERGER: Mr. Chairman, not related to the specific question that you raised, but to a prior question and answer that Mr. Skinker gave, and it seemed we had lost 100,000 gallons a minute of water someplace in the plan.

An explanation to the different numbers -- whether the discharge was 400,000 gallons a minute, as was previously thought, and why the figure now was 302,000 --- just for purposes of accuracy, I wanted to indicate that in fact, the discharge is the 400,000 gallon a minute figure and the difference in the two numbers relates to the fact that 100,000 gallons a minute is being used to sluice the solids into the lake, and the reason for the 100,000 gallon a minute reduction, which again comes about because it would no longer be necessary to sluice the solids into the lake.

Does that answer the question? John, the question you raised was: Was it 400,000 gallons a minute or 300,000? You are absolutely right; it is 400,000, and the difference is whether we talk about processed water with or without the addition of 100,000 gallons being used as sluice water.

MR. BADALICH: It is my understanding the other 100,000 were required for hydraulic means to carry the tailings off the launder, etc.

MR. WEINBERGER: This is exactly right.

MR. STEIN: Are there any other questions of Reserve?

MR. FRIDE: I might say, if there aren't any further questions on behalf of the company and the participants here on behalf of Reserve, we certainly want to express our appreciation to the conferees for the manner in which they have considered this proposal, and I would suggest that it is very much a good faith proposal. It is one which Reserve believes has been carefully assessed from all of the standpoints that are of concern to the conferees as well as to the company. And to the extent that Reserve can contribute any of its resources to provide any other kinds of information that the conferees might desire, we certainly pledge ourselves to that.

MR. STEIN: Thank you very much.

MR. BADALICH: Mr. Chairman, you listed more or less the considerations to be given to this matter before we go into any detailed discussion.

Could you add on there also the possibility of the company starting the preparation of some detailed plans of some onshore or onland disposal --

MR. STEIN: We could.

MR. BADALICH: -- as another condition to be considered this afternoon?

MR. STEIN: Right. We will get into that.

Again, Mr. Badalich, before we get into that, I have this question: Are we going to leave this up to the company to select the specific site that they are going to come up with on onland disposal?

MR. BADALICH: I think they could probably consider two or three different alternatives for this method and leave it up to them.

MR. STEIN: Okay. In other words, we would ask them -- and I listed about four that came to mind to me and let me give you these again. I don't know if the company wants to do this: One is this onshore, lakeshore operation, and I don't know that it has to be that close to Silver Bay. You might be able to move up a little. The other is Lax Lake, or something like that, which is a depressed piece of land, which is relatively close. And the other is getting back in the vicinity of the mine to put it in that hole, or a hole relatively close to there, the thought being that you have trains coming down from the mine and presumably those trains have to go up and you can carry something in the trains.

Now, I believe there was one more man who said he wanted to speak for 3 minutes. Do you have his name. Is he here?

MR. BADALICH: Yes. I believe it is somebody representing the Northern Environmental Council. I had his name here a minute ago.

MR. STEIN: I see a movement in the back.

STATEMENT OF BRUCE M. NISS, CONSULTANTS ASSISTANT, NORTHERN ENVIRONMENTAL COUNCIL, DULUTH, MINNESOTA

MR. NISS: Thank you very much, Mr. Chairman and Mr. Badalich, for remembering me.

I just wanted to make a few points about Mr. Stein's comments yesterday about preserving some of these alternatives that we have to have, and I was pretty well gratified to see that this was coming up toward the end of the hour here.

I hold in my hand a card issued to all officers in the U. S. Army on decision-making. This is the logical process to go through to reach their decisions. And I want to read some of the steps from it.

1. You determine the situation that you have and the different courses of action.

2. The next step: Analysis of opposing courses of action.

3. Comparison of your own courses of action.

4. And the last step: The decision.

Well, it seems we have gone through the first step, which is the situation, in the courses of action. We have listed the number of proposals that have been brought up, and we certainly know what the situation is. But -- I think this was coming up toward the end of the lunch hour here -- the step that I think we are missing is the analysis of the opposing courses of action. Nowhere have I seen yet a concrete -- even a proposal for something having to do with onland disposal. We have heard Reserve's very technical and complicated report on disposal back in the water, but the only thing that we have so far is the Bureau of Mines study for onland disposal which Reserve admits is not complete, that it is only kind of a superfluous thing, but yet they seem to use this as their basis for rejecting onland disposal. And if this study is not completed, I certainly think that we should get a complete study and, as I said, this started to come up again.

As I said, the Bureau of Mines study was only a preliminary one, and I would like to see a study of onland disposal having something to do with recycling the water. This question has come up about what will be done with the water. By recycling I mean pumping the particles up to wherever they are going to be put, either onland next to the plant, which I think we should study -- either onland at Lax Lake, which we should study -- or onland in --

MR. STEIN: How long would you give this? How long do you think we should take to complete these studies?

MR. NISS: How long has Reserve had to come up with these proposals?

MR. STEIN: Well, I --

MR. NISS: About 2 years?

MR. STEIN: Do you think we need another 2 years? And what do we do then? Or a year? Is that your suggestion?

MR. NISS: I think that it should take enough time so that we ensure that the lake is protected.

MR. STEIN: But what do we do in the meantime? Do we use your proposal to let Reserve do what they are doing and then take our time and really study this out? Is that your proposal?

MR. NISS: Mr. Chairman, I mean no disrespect, but if we let them keep pumping into the lake, as you said, this pumping into the lake will not go on for 2 years but for 42.

MR. STEIN: All I can do is commend people to read the testimony that we painstakingly gathered. We got experts, and Reserve brought in experts from all over the country, and recorded these in these transcripts. We have tried to repeat here the problems we were having with the Reserve discharge in the lake, both in water quality and with the fines fanning out and finding their way over vast areas of the lake.

Now, if we are not going to resolve that or get that, we have got a problem. Sir, as I understand your proposal, what you are suggesting is we take another year or two to complete these studies before we come to a decision on comparative means. Is that correct?

MR. NISS: Sir, of course, I do not have the technical knowledge to decide how long it would take, but I think we should take the time to ensure that the lake is adequately protected.

MR. STEIN: All right. Thank you.

MR. NISS: And may I make one other statement? I don't think that this has been brought up. If we are searching for an agency to do this, may I suggest the Corps of Engineers that has issued the permit in the first place?

MR. STEIN: Your suggestion is appreciated. I have worked with the Corps of Engineers for years.

MR. NISS: Thank you.

MR. BADALICH: Mr. Chairman, before we recess, I would like to introduce for the record the letter from Governor Wendell R. Anderson to Mr. Ruckelshaus, the Administrator of the Environmental Protection Agency whereby the Governor does join with the State of Minnesota at this conference.

(The above-mentioned letter follows in its entirety.)

"Dear Mr. Ruckelshaus:

"On the basis of then available evidence, Secretary of Interior Udall on January 16, 1969, called a conference to consider the matter of pollution of the interstate waters of Lake Superior and its tributary basin (Minnesota, Wisconsin and Michigan) under provisions of Section 10 of the Federal Water Pollution Control Act as amended (33 U.S.C. 466 et seq).

"Under the authority vested in me, the State of Minnesota hereby joins the Lake Superior Federal-State enforcement conference. It is my desire that the conference evaluate the interstate and intrastate effects of all sources of pollution of Lake Superior, particularly with regard to that issuing from the Reserve Mining Company plant at Silver Bay, Minnesota, and to take appropriate action.

"Sincerely, Wendell R. Anderson"

MR. STEIN: Thank you.

I guess the consensus is we recess for lunch. Would it be possible, gentlemen, to have everyone back at 1:30? Is that agreeable? We stand recessed until 1:30.

(Noon recess.)

AFTERNOON SESSION

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MR. STEIN: All right. Let's reconvene. We are reconvened.

I have a telegram here saying: "We encourage enforcement of the standards now in effect for Minnesota, Wisconsin, and Michigan for Lake Superior, for municipalities as well as industry and all other dischargers." Signed Mrs. O. J. Janski, State President, League of Women Voters.

I have another telegram, and I am going to read the signer of the telegram before I start it because I am going to use this as the basis of the first motion for the Executive Committee Session which we have now, and I might announce that this is an Executive Committee Session though we do it in the open, and just the conferees will participate.

This telegram is from Patrick J. Lucey, Governor of Wisconsin. It states: "Please read this message into the record for me. I strongly urge the conferees not to approve the Reserve Mining underwater disposal plan presented January 14, 1971. An indepth study of land disposal should be presented by an unbiased committee within 60 days. Under no circumstance will I support the underwater disposal plan." (Applause)

In view of the commitments we have and the testimony here and the request of Governor Lucey, I would like to suggest this: that we set up a committee representing the conferees, and we can decide who the conferees want to be their representatives, so we have a committee that we want to name who will report to the conferees within 45 days. This is kind of splitting the difference between 60 days and a month.

The committee will consider land disposal as well as the underwater disposal plan presented here and come up with its evaluation as well as its recommendations.

I think in view of Governor Lucey's telegram, he probably sent a note for this thing with these minor modifications which he would suggest. I think we can meet the purposes of what Governor Lucey wants to do and accomplish the other facets of the conference as well.

Are there any comments?

MR. PURDY: Mr. Stein, is it intended that this technical committee would evaluate -- make on-site surveys and evaluate new onland disposal sites and go through all the detailed engineering that would be necessary to make an independent appraisal?

Executive Session

MR. STEIN: I don't think they can do that certainly within 45 days. I also say if we had a committee doing this, we would do what a regulatory agency has never done, and that is make proposals to industry, or the cities. We have generally done this the other way and had them -- the polluter or the discharger -- make a proposal to the regulatory agency.

But I think in light of this, we can just look at the -- the committee can just look at the feasibility of this kind of thing and hopefully get in touch with Reserve or any of the other parties and ask them to consult with them and see what recommendations they can come up with.

Now, I think we are faced with several propositions. We are faced with the proposition of -- and let's start the other way by saying we are going to entertain the Reserve proposal for underwater disposal as is. We are going to entertain that and recommend it with modifications. We are going to reject it and tell them to go to a land disposal system, or we are going to reject it completely—that they haven't come up with a remedial program, take appropriate legal action and let the court decide what the solution should be.

Now, these are the alternatives for the

conferees. But in view of Governor Lucey's suggestion, I suggest we try to make that viable in the way we can within our professional abilities and at least we can come up with a judgment one way or the other with this committee report.

MR. PURDY: I don't disagree with that, Mr. Stein. I would have disagreed if it were intended that this technical committee would have sufficient time within 60 days and even the capabilities of making that sort of — of making an independent appraisal which would look at new sites and make new engineering estimates.

MR. STEIN: I have a further question than that, Mr. Purdy. I don't know how many days we are going to have, whether this is the function of a regulatory agency or an independent committee, to come up with this.

MR. PURDY: I don't feel that it is.

MR. STEIN: Neither do I. But I am trying to make the suggestion of the Governor work. I think with this kind of committee we can come up with a report, My suggestion also is that we do this in 45 days,in view of what the scope of the mandate of this committee will be.

Is this concept acceptable? In other words, they will consider the notion of on-site disposal, underwater disposal, the question of the -- and this, I think encompasses the suggestion that Mr. Badalich made just before we --

MR. BADALICH: Mr. Chairman, it probably does to some extent. I was just wondering whether we couldn't put some burden on the company also. Wouldn't it be well for the company to come up with an onland disposal system within say 3 to 4 weeks, and then in turn submit this to the committee for evaluation and review?

MR. STEIN: We will be glad to do this if the company would assume this.

The key word, in reading this telegram that I got at noon from Governor Lucey, was "unbiased," and I don't know -- I don't know how you feel in Minnesota, but I am not sure that the company can be qualified as "unbiased."

But if I might, I would suggest that we set up the committee and it can be established almost immediately, and we can ask the company to volunteer, and the committee can have its specifications of what it would ask the company to provide to them. In other words, I would like to give this to the committee when they have had a little thought and discussion with both and not set these specifics at a table like this . I think we know what we are driving at, but I think this has to be the committee and the company deciding what they want and what was within the capability of the committee to give. This will require a technical kind of discussion which we can leave to the committee.

MR. BADALICH: I think that would be satisfactory. I just don't want to lose sight of the massive input that the company has already made in this matter.

MR. STEIN: That is right.

MR. BADALICH: And certainly economics are going to be taken into consideration, and I believe that the company has brought forth plans on onshore disposal and they are certain to be utilized by the committee.

MR. STEIN: Would the company have any objection in participating with this committee?

MR. FRIDE: No, sir.

MR. STEIN: If this is agreeable -- and I don't want to push this too far -- do you think this should be a technical committee, or do you want the conferees themselves to be on this committee? What is your judgment? Do you want to name people to it?

If you do, and if this is agreeable to you, I think in order to handle the expenses and provide the secretariat, I would propose that we set up a committee representing the conferees, and that the Federal Government assume the secretariat of the committee so we can arrange for whatever travel, room expenses, or other material is necessary.

Let me go down the list. Mr. Mayo -- by the way, you are not limited to one on this committee, and I suggest this thing is so important that if you feel you have to get one, two, three, four, or how many people you need, you just name them to the committee.

Who would you suggest, Mr. Mayo?

MR. MAYO: Let me clarify a point that you made, Mr. Chairman, with respect to the secretariat responsibilities. Are you suggesting that we pick up the expenses of the non-Federal committee members, or that we just provide the secretarial facilities for the making of arrangements?

MR. STEIN: We will provide the secretarial facilities for maintaining it. If any of the States feel they don't have enough money to travel and they can't handle this, I think this is so important we will make that money available, too. But I think generally the States would prefer to travel on their own.

Now, if they don't, or you feel you need any extra money, just let me know, and we will make that available.

MR. MAYO: As a Federal conferee, I would go along with the assignment of the secretarial responsibilities, and we would be prepared, if necessary, today to name our participants.

MR. STEIN: Why don't you do it?

MR. MAYO: It will be dual participation at least: Mr. Bryson and Dr. Mount.

MR. STEIN: Whom would you want to assume the secretarial responsibility?

MR. MAYO: Our Lake Superior Basin Office.

MR. STEIN: Mr. Bryson?

MR. MAYO: Mr. Bryson.

MR. STEIN: Mr. Bryson.

How about Michigan, Mr. Purdy, do you want to name someone?

MR. PURDY: I anticipate it will be Mr. Joe Ball from our Upper Peninsula Office.

MR. STEIN: Mr. Frangos.

MR. FRANGOS: Mr. Chairman, for the time being I will accept that assignment.

MR. STEIN: Minnesota.

MR. BADALICH: Mr. Chairman, at this time, we will certainly accept it as far as the conferees are concerned, but I couldn't name the other additional people that might be named to support our study in this -- or the people that participate.

MR. STEIN: The primary contact now for this committee will be Mr. Badalich.

Let me run this through again. The committee will be composed -- Mr. Dale Bryson will be in charge of the secretariat. Dr. Mount will also serve as an advisor for the Federal Government. Mr. Joe Ball will probably be the man for Michigan with any alteration or possible change to be made.

At the present time for Wisconsin, the contact will be Mr. Thomas Frangos.

And for Minnesota, Mr. John Badalich.

I would recommend, Mr. Bryson, that if we do this, and you have your charge, that you make your arrangements today before they leave, set your first meeting, and make arrangements with representatives of the Reserve Mining Company. Who have you generally been in contact with, Mr. Fride?

MR. BRYSON: Mr. Schmidt or Mr. Fride.

MR. STEIN: Mr. Schmidt or Mr. Fride will be the dual contacts with Reserve, and you will make your arrangements with them. Of course, any of the other of the conservation groups or anyone else you want to call into this, I would strongly urge that everyone get all his theories out on the table at least at this go-round, so that every time I come out here I don't grab another brass ring. Because every one we grab is another few months delay. If the conservationists and the other people who felt so strongly about land disposal would have made their views that well known at the last conference, we might have been a little ahead.

I would think that this is a technical committee, and we are not looking for votes or anything else. If there are different views, we are going to take all of the views, and I think, Mr. Bryson, unless you want a chairman, should serve as the secretariat. This is not that kind of committee. We just want to get all of the facts out. If we have that, that is the main point. We would ask that you report back to the conferees in 45 days. As soon as you get under way and give us a prognosis, we will set a date for another session of the conference, at which we will consider your report and evaluation and try to come to some conclusion.

Now, we have two other matters I would like to take up, and any others that the conferees want to. One is this regional plan, and the other is red clay. But let's take up the regional plan.

Mr. Badalich, would you want to see if we can get some expression from the conferees on that?

MR. BADALICH: I think, Mr. Chairman, what I did ask is for the conferees' concurrence on the action that the agency took in extending the intermediate dates to the dischargers within the area -- this was given a 6-months' extension -- and go along with that particular proposal of reaffirming the action of the Minnesota Pollution Control Agency.

MR. STEIN: But how about the approval of the whole plan?

MR. BADALICH: Well, we very definitely would like the conference to take some action in that regard also.

MR. STEIN: But do we understand -- as I understand the plan -- that the outside dates for completion would be at the most 1975? Is that the end of 1975?

MR. BADALICH: Well, at this time, I think it is highly speculative, but considering probably the most adverse conditions that could arise, I would say 1975 -- the end of the construction season 1975 would be the maximum outside date.

MR. STEIN: What is the end of your construction season?

MR. BADALICH: Probably October, November.

MR. STEIN: I have been outside. I think it is a little later around here, but I guess you fellows are used to it.

Okay, now, presumably a good portion of this work might be done between 1973 and 1975, ahead of that.

MR. BADALICH: Yes, I am sure that a lot of the work will be done concurrently. That is the interceptors as well as the treatment plant.

MR. STEIN: I don't know -- and you fellows can pass -- but let me have an expression from the conferees because I think we need this.

As I understand it, Mr. Badalich will be in Washington on Monday, and I think it will be very helpful for us if we have an expression of the conferees of what you think of this regional plan that Mr. Badalich proposed.

MR. MAYO: I would like to read what might be a statement in connection with this in the form of an action on the part of the conferees, and I offer this for your consideration.

The conferees are on record encouraging the development of areawide waste treatment facilities. The proposal by the Northeastern Minnesota Development Association for regional waste treatment facilities serving the Cloquet-Duluth-Superior area generally conforms with this concept. The conferees concur with Minnesota in the granting of a moratorium on an interim basis for the municipal and industrial discharges until July 1, 1971, to permit the passage of enabling legislation, and development of the necessary operating entity. If the legislation and operating entity are not developed by this time, the currently established schedule will remain in effect.

MR. STEIN: Do you want just the legal amendment to that?

MR. MAYO: Fine.

MR. STEIN: I would say "to permit the opportunity for passage."

MR. MAYO: Okay.

MR. BADALICH: Mr. Chairman, we certainly accept that.

MR. STEIN: Right.

Are there any problems?

MR. PURDY: I don't know as there is a problem, but I wonder what communities and industries are included in this? Is this Minnesota industries and municipalities along the St. Louis River or does it also include Superior, Wisconsin, and, if so, how would this affect the action that the State of Wisconsin has initiated against Superior or proposed action?

MR. STEIN: Mr. Badalich.

MR. BADALICH: Well, I certainly think it would include Superior. At least that was my thought on this matter. I believe Mr. Frangos can speak to that.

MR. FRANGOS: Yes, Superior is one of the communities that is included in the proposal, and I don't believe that this action that would be taken by the conference would affect our own legal proceedings at this time.

MR. PURDY: Then, I am in agreement with them.

MR. STEIN: Okay.

Mr. Frangos, are you in agreement with this?

MR. FRANGOS: Yes.

MR. STEIN: Mr. Badalich?

MR. BADALICH: Yes, sir.

MR. STEIN: All right. I guess the conferees are unanimously in agreement with this, with just technical modification.

I have the next point, and that is on the red clay situation. Again, in looking at this, I direct myself to the Wisconsin people —

MR. MACKIE: Mr. Chairman, following Mr.

Stoddard's presentation yesterday, we discussed this matter with him, and we will be meeting with Mr. Stoddard and some of the people involved in this later this month, and we will be prepared to comment on this at the next meeting of the conference.

MR. STEIN: Okay.

Now, you understand we are probably going to meet very shortly after 45 days, and I think you will be ready then. You should have a proposal or an evaluation from Wisconsin at that time.

MR. MACKIE: We will have some sort of a report on it at that time.

MR. STEIN: All right.

And I think this about does it for the conference.

Do you have any other notions? I think we have come a long way, in the sense when you get a conclusion like this we are moving this problem forward.

MR. BADALICH: Mr. Chairman, I have one statement I would like to file. I just received this from the League of Women Voters of Minnesota, and I would like to file this statement with the conference.

MR. STEIN: Right. That will be filed as if read.

(The above-mentioned statement follows.)

League of Women Voters of Minnesota, 555 Wabasha St., St. Paul, Minnesota
January 1971

Testimony presented by the League of Women Voters of Minnesota
at the Lake Superior Enforcement Conference
January 14 and 15, 1971
Radisson-Duluth Hotel, Duluth, Minnesota

The League of Women Voters of Minnesota commends the Minnesota Pollution Control Agency for the standards for air and water quality that have been adopted. We all recognize that the effectiveness of any standards depends upon their enforcement. We also recognize how difficult it often may be for an industry or municipality to comply with these standards. We sympathize when a variance is requested and recognize that occasionally a variance must be granted. We maintain, however, that no industry or municipality should be granted a variance from the regulations other than for an extension in time to allow for adequate compliance.

We expressed these same sentiments almost two years ago at the first Lake Superior Conference. Since that time, we have seen many operations comply - some with great difficulty and financial burden - we have seen others continue to request variances of one kind or another, not just for time extensions, but for variances from the regulations. As long as this Conference continues to allow variances they will be requested.

Last August the Conference proved where pollution exists. We urge that at this time the Conference demand the compliance with Minnesota Pollution Control Agency standards by all industries, municipalities and dischargers now in violation. We also urge that all dischargers in Wisconsin and Michigan, also under the jurisdiction of this Conference, be obliged to comply with their regulations.

We believe that extensions of time for variances must end. Pollution has been proved and time tables for the clean-up of Lake Superior must be enforced.

Executive Session

MR. STEIN: I think we are very close to a solution and, as far as I am concerned, we are very close to a decision one way or the other.

Let me give you just my personal view on it for what it is worth. We have been up here several years now. I think the problem we have on Lake Superior has received nationwide attention and nationwide attention because it is a very, very important problem that strikes at the conscience of every American. You are not on the line of the big city newscasts or anything of that kind, but you have a very special problem here and a very unique resource. It is my view that the time is long overdue to come up with a solution one way or the other. And I don't think that we have been serving any useful purpose -- perhaps we are long past that -- by coming here meeting after meeting after meeting and discussing this problem and coming up with new notions and new approaches and moving in fits and starts in various directions without getting on with the job. Because while we have achieved a measure of success and a major measure of success in a lot of the municipal and industrial waste pollution abatement measures here, we haven't abated one iota of the waste load coming from Reserve Mining. We are leaving here again to further consider this, and further go away with not one iota of that pollution abated.

When you get up at 4:00 o'clock in the morning and look at yourself in the mirror sometimes, think of that, because I think of that. And unless we resolve this pretty fast, as far as I am concerned, we have a system in this country whereby we can resolve it, and the judge can give us a solution on this.

Now, I hope we come to a resolution of this and get on with the job, because nice cozy meetings like this, where it is warm inside and cold outside, are not in themselves abating pollution. Our job is to abate pollution, and I think we are right on the last road and we have to do the job.

Thank you all for coming and participating, and we stand adjourned. (Applause)

(Whereupon, the conference adjourned at 2:10 p.m.)

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(The following letter was received following the adjournment of the conference.)

RANDALL & MURRAY
ATTORNEYS AT LAW
402 EAST HOWARD STREET
HIBBING, MINNESOTA 55746

JIM RANDALL
GAIL MURRAY

TELEPHONE 263-7706
AREA CODE - 218

January 14, 1971

Mr. Francis Mayo
Regional Director E.P.A.
33 East Congress Parkway
Chicago, Illinois

Re: Village of Kinney Sewer Disposal

Dear Mr. Mayo:

I appeared Thursday, January 14, at the conference on the matter of pollution of Lake Superior and tributary waters and gave the following information to one of the aids who request I send you a report of same to be placed on the record.

The Village of Kinney which lies within the area in question is proceeding with plans to up-grade the sewage disposal facilities along the lines suggested to us by the Minnesota Pollution Control Agency.

The preliminary report was submitted in June of 1970 by our Village engineer for this project, Robert Wallace and Associates, Hibbing, Minnesota, and we are presently awaiting word from the Minnesota Pollution Control Agency before proceeding further.

We have entercountered difficulty in raising grants and/or loans to aid the Village in construction of a new sewage disposal plant as the Farmers Home turned down our application for assistance since the Village of Kinney is scheduled for possible relocation beginning in 1980.

We are anticipating some possible help from the Minnesota State Legislature this session and by assumed that the Village of Kinney will cooperate to whatever extent possible and as our limited funds allow in combating pollution.

Yours very truly,

Jim Randall

JIM RANDALL

JR:dmt
cc John Badalich
cc Rade Zakula
cc Bob Wallace

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